A Database Publication

THE MICRO USER

Volume 5
Number 1
March 1987
£1.25

Top-selling guide to the BBC Micro!

ARCADES
How to improve your scores

PRINTERS
Deciphering the codes

COMMS
Electronic mail simplified

GAMES
Play detective
Ride a dinosaur

EDUCATION
Word processing for infants

4th BIRTHDAY CONTEST

BBC Micro's vital role in airport safety

STRYKERS
RUN

The first release to include a specially enhanced version for the BBC Master making use of its 128K RAM. An extra 40K of detailed graphics are provided together with additional game features and atmospheric music.

Commander Stryker under fire in the city

Battling in the air

An action close-up

Enemy equipment (Enhanced BBC Master version)

A camouflaged Battle fortress (Enhanced BBC Master version)

STRYKER'S RUN for the BBC Micro B, B+, Master and Master Compact.

Stryker's Run features probably the best graphics ever seen on the BBC Micro; the action is intense and the animation is superlative.

The battlefield graphics include cities, edifices, wrecked buildings, trees gravestones, bridges, despatch-posts, military bases, helicopters and jet ships, with hills and mountains in the background. The Master-enhanced version also includes statues, watch-towers, a neglected cafe, a deserted cinema, aircraft hangars, aeroplanes, trucks and tanks.

For many years, a war has ensued between the Allied Nations and the Volgans. The battle was reaching a stalemate position, but recently the Allies through good intelligence work and some luck have managed to obtain the plans of the Volgan's next offensive. If the Allied Forces can capitalise on these plans they can end the impasse and the war. You play the role of Commander John Stryker commissioned to take this top-secret information to the Allies' HQ.

Your character in the game can jump, run, duck, fire his laser pistol and throw grenades. He can also board aircraft and fly them, making use of their more powerful weaponry.

Your opponents, the Volgans, have a variety of weapons at their disposal comprising rifles, pistols, grenades, machine-guns, mortars, mines, helicopter gunships, rocket launchers and SAM missiles.

Game Author: Chris Roberts.

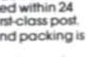
Compatible with the BBC B, B+, Master and Master Compact computers.

PRICE: £9.95 (cassette), £11.95 (BBC Micro 5¼" disc), £14.95 (Master Compact 3½" disc).

PRIZES PRIZES PRIZES PRIZES PRIZES PRIZES PRIZES PRIZES PRIZES PRIZES PRIZES

If you complete the game, you can enter our competition. The prizes include a radio controlled 4-wheel-drive off-road racer (worth £200) complete with control system, trophies and £20 in consolation prizes.

Closing date: 31st March, 1987.



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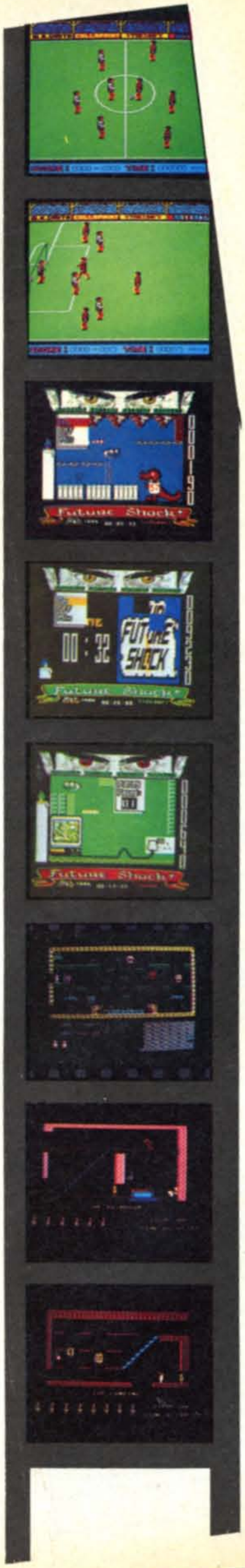
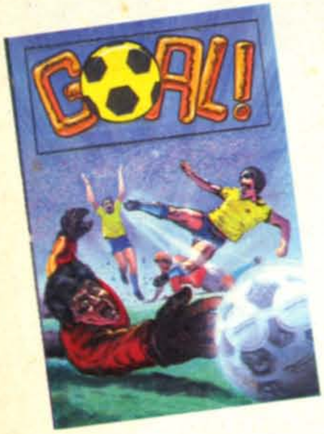


GOAL!

BBC/Electron

The first realistic football simulation for the Electron featuring excellent graphics, music and an intelligent opposition that actually adjusts its skill level during the game depending on current state of play.

Cass. £7.95



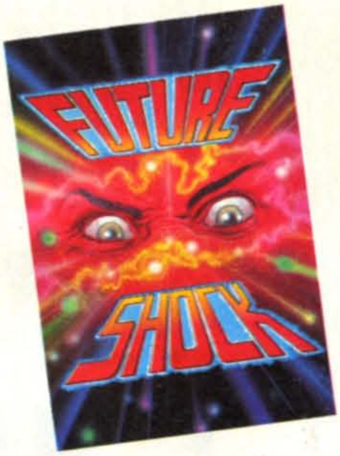
FUTURE SHOCK

BBC/Electron

An amazing new style of Arcade game with inter-active sub plots, using large detailed graphics for superb detail. This game pushes the machine and the player to unparalleled limits for many hours of enjoyment making this a game not to be missed.

Quote from Electron User:– December Issue.
"Future Shock is an excellent program, a game which overflows with character and humour." "Overall Rating 9/10"

£7.95 Cass.



THE BIG K.O.

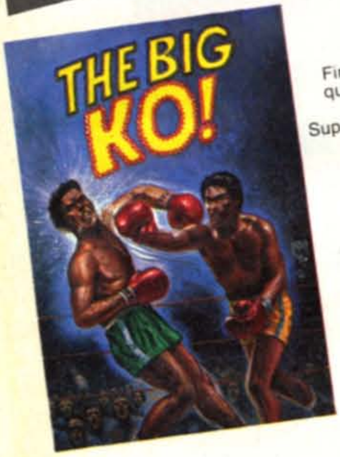
BBC/Electron

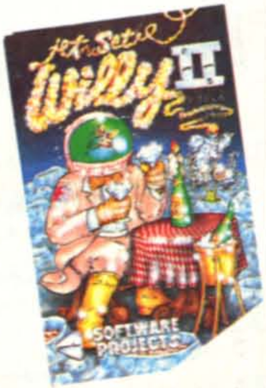
Finally a BBC/Electron Boxing Simulation of the highest quality. This game offers features until now not seen on Acorn Computers.

Superb sound, quality, super-size graphics, 6 progressively more cunning opponents and a multi-player mode will undoubtedly make this the Sports Simulation of 1987.

Cass. £7.95

NEW RELEASE





JET SET WILLY II

BBC/Electron

Over 90 screens of this classic game will give even the most skilful player the ultimate challenge.

£7.95 Cass.

NEW RELEASE

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THE MICRO USER
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COMMS
GAMES
EDUCATION
BBC Micro's vital role in airport safety

Vol. 5 No 1 March 1987

Managing Editor
Derek Meakin

Features Editor
Peter Davidson

Production Editor
Peter Glover

Art Editor
Heather Sheldrick

Associate Editor
Alan McLachlan

Reviews Editor
Christopher Payne

News Editor
Mike Cowley

Advertisement Manager
John Riding

Advertising Sales
Peter Babbage

Tel: 061-456 8835 (Editorial)
061-456 8383 (Admin.)
061-456 8500 (Advertising)
061-480 0171 (Subscriptions)
Telecom Gold: 72:MAG001
Telex: 265871 MONREF G
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Prestel Mailbox: 614568383

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Jan-June 1986

The Micro User welcomes program listings and articles for publication. Material should be typed or computer-printed, and preferably double-spaced. Program listings should be accompanied by cassette tape or disc. Please enclose a stamped, self-addressed envelope, otherwise the return of material cannot be guaranteed. Contributions accepted for publication will be on an all-rights basis.

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CONT

Games

23 Birthday Mystery
Use logic and elimination to solve this dastardly crime.

56 Dino
Have you the skill to keep our hero astride his gobblosaurus?

Utilities

107 Compressor II
Save valuable memory by creating multi-statement lines.

142 Teletext Carousel
This utility will allow you to peruse stored pages at leisure.

Reviews

32 Software Scene
Our evaluators try out the latest adventures and arcade games.

DODGY GEEZERS
JOHN'S CAFE
MELBOURNE H
Trivial Pursuit
COLOSSUS 4 CHESS
CDS Software LTD
ORNSOFT
Willy II

48 Casper 68000
A second processor that turns an 8-bit micro into a 32-bit powerhouse.

59 Knitting Softwear
Just how useful is this new design package for home knitters?

125 Halcien
This latest language takes the strain out of complex plotting.

Education

61 News
How the BBC Micro is increasing its involvement in education.

65 Word Processors
Can they really be of any use in Primary and Infant education?

67 Education Reviews
Our experts cast a critical eye over some of the latest releases.

71 Letters
You express your views on the BBC Micro's role in education.

73 Half-Life
A fascinating simulation of radio-active random decay.

ENTS

Features

7 News
All the latest in the ever-changing world of your BBC Micro.

20 Case Study
How the BBC Micro is being used to improve airport safety.

36 Comms
Don't be baffled by the jargon of tele-communications.

41 Begin Here
Discover how to READ and PRINT tables of DATA.

44 Hac Man
Delve into the mysteries of your favourite arcade games

51 Command Clashes
A reader's rom problem produces some useful advice.

53 Problem Solved
More solutions to those mind-boggling hardware puzzles.

86 Adventures
Are those tricky mazes driving you round the twist?

90 Body Building
Our technical guru tells of three ways to take your temperature.

106 MicroLink News
More about Britain's nationwide online database for micros.

111 6502 Games
Collision detection is easy with this machine code routine.

114 Regal Micro
Why a BBC Micro is at the heart of Brighton's Royal Pavilion.

117 Spreadsheets
Learn the techniques of Ultracalc and how it differs from Mini Office II.

120 Competition and Survey
Help decide the future contents of The Micro User.

122 Library
A new feature brings together the skill of experienced programmers.

128 Machine Code
Learn how to address your computer with absolute precision.

133 Printer Power
Exploit your printer's features to the full: The codes explained.

136 Pagemaker Hints
Mousing around with the AMS's top-selling publishing package.

139 Pseudo-Code
Program planning is easier using these alternative ideas.

151 Gallery
Ideas galore from these masterpieces drawn with a mouse.

153 Letters
The chance to get your news, views, moans and name into print.

THE MICRO USER is four years old!

We're celebrating our fourth birthday by giving *The Micro User* a streamlined new look – with more illustrations, a wider use of colour, much crisper listings and far more pages dedicated to solving the computing problems of our readers.

(What hasn't changed is the much praised Micro User style of making a difficult subject easy to understand!)

But we're certainly not resting on our laurels. New features are now being developed aimed to reflect the changing needs and interests of BBC Micro users.

You, too, can help influence these changes – simply by completing the reader survey form on Page 121.

What you have to say could well affect the contents of future issues. It could also win you a handsome prize!

NEXT MONTH

Utility:
Make your discs copy-proof

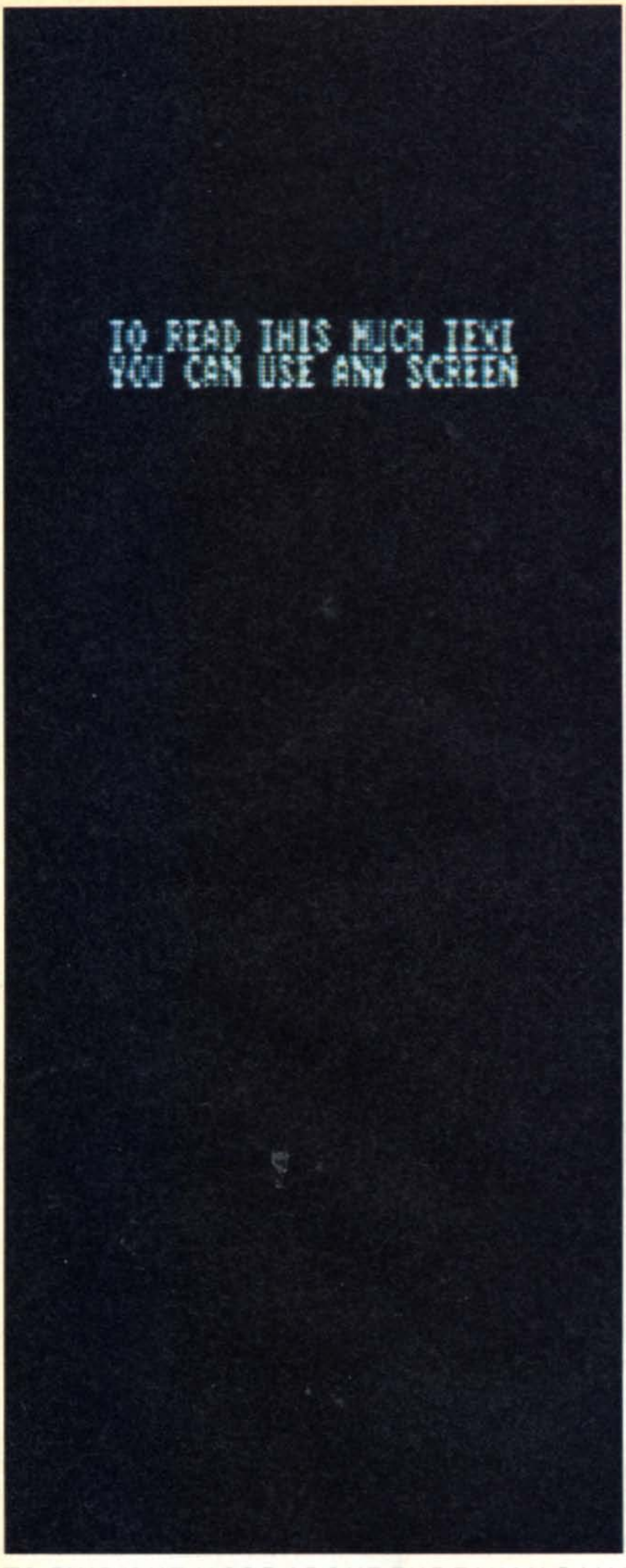
Hac Man:
The secrets of Repton 3

Discs:
Is dearest always the best?

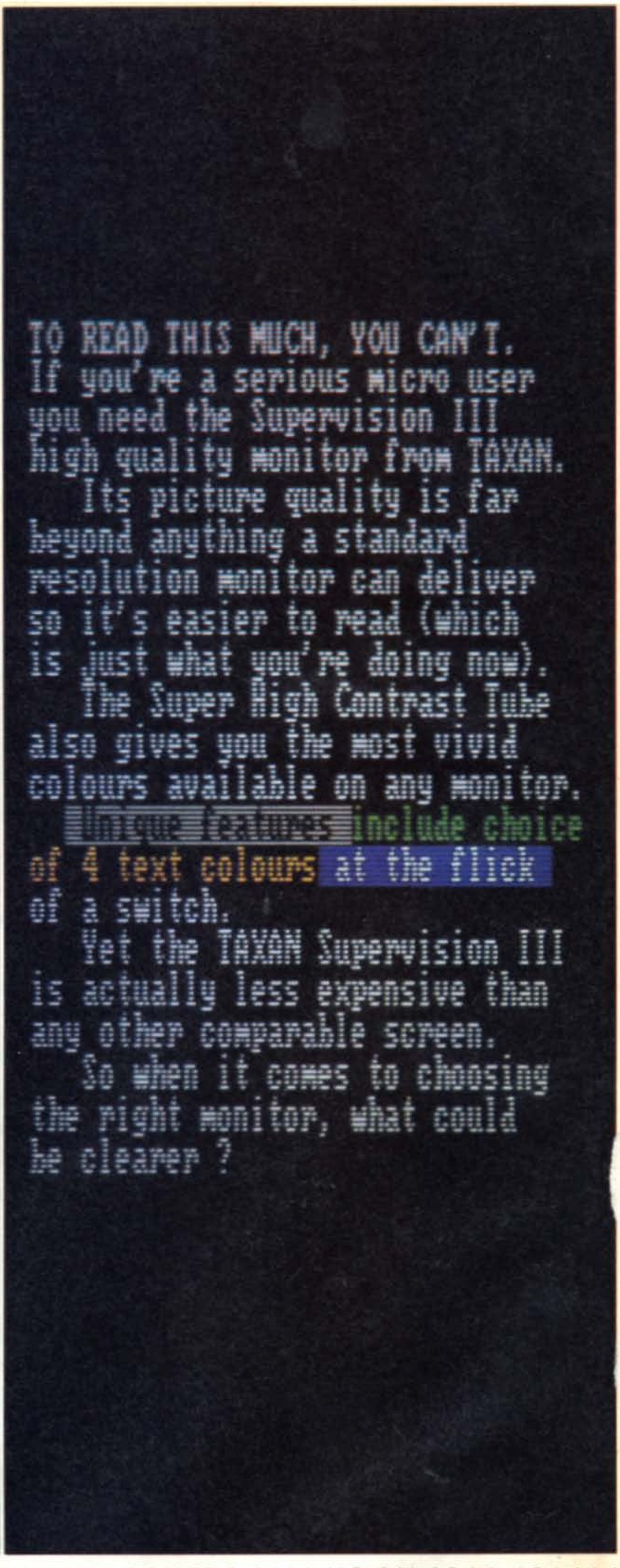
Reviews:
Daly Thompson's Supertest, Yie Ar Kung-Fu 2 and more!

Easter Game:
Hunkie Egg

THE MICRO USER **April issue on sale March 11.**



TO READ THIS MUCH TEXT
YOU CAN USE ANY SCREEN



TO READ THIS MUCH, YOU CAN'T.
If you're a serious micro user
you need the Supervision III
high quality monitor from TAXAN.
Its picture quality is far
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so it's easier to read (which
is just what you're doing now).
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PERFECTING THE IMAGE

NEWS

Rapped over add-on

ACORN is facing mounting criticism over its 512k add-on board which provides 70 per cent PC compatibility for the Master 128.

Reason is that the company has failed to point out that it will only work properly with an 80 track dual disc drive.

Now customers with 40 track and 80 track single drives who have bought boards are up in arms, for at no time has Acorn pointed out any limitation of use in its advertising.

Contacted by *The Micro User*, Acorn's customer services department admitted they had received a number of complaints.

"Yes there is a problem in this area", said the spokeswoman, "for an 80 track dual disc drive is essential. We have now asked that all our future advertising carry this fact".

Acorn is understandably concerned that this situation be cleared up as soon as possible, for the company is hoping that the add-on board will allow the Master to challenge the Amstrad in the small business market.

In order to boost its chances in this area the company recently slashed the price of the add-on board by £200 to make it more competitive in this sector

Now offered at £199, Acorn believes it will sway existing users from opting to buy a cheap clone.

Questioned about the possibility of a refund for people with single drives who have already bought the 512k add-on board, the customer services spokeswoman added: "This will obviously have to be discussed".

Acorn taking no risks with RISC

ACORN is understood to be developing a world-beating micro based on the revolutionary RISC chip.

Though the project has top secret classification, some details have been leaked to *The Micro User*.

According to usually reliable sources, the new machine will be 32 bit, fully IBM compatible and provide unrivalled sound and graphics.

"Now all Acorn has to do is get the price right and they'll be back on top", said one informant who claims to be privy to the specifications.

The news that Acorn is working on such a machine – though still to be confirmed by the company itself – will not come as a total surprise to the industry.

After all, a number of observers have predicted that Acorn would follow this route after its back room boffins unveiled the RISC super chip last year.

Designed and developed by the research and development team at Cambridge, it is now being made under licence by Arizona-based VLSI Technology.

RISC involves cutting down the number and complexity of processor instructions.

And the Acorn chip is believed to be the lowest priced of its type on the world market today.

It has just 44 basic instructions, which means it can perform with great speed.

Running at four million instructions per second it is much faster than either Intel's 80286 chip or Motorola's 32 bit 68020.

"A machine based on this would certainly have the competition worried", commented one observer.

"For once Acorn seems to have got its act together. Now it is reverting to what it is best at – research and development – rather than Amstrad-chasing, to keep them up with the leaders.

"Just pray Acorn gets its marketing right this time".

Latest on the new machine is that it will not be unveiled until the end of this year at the earliest.

Watford DFS deal

FOLLOWING an agreement with Acorn Computers, Watford Electronics has upgraded its disc filing system to enable it to support a second processor.

Acorn is allowing its Tube Host Code to be used in the latest Watford DFS, version 1.44. Until now users of Watford's single density DFS needed Acorn's DNFS rom, with its Tube Host Code.

The Tube Host Code is the only section of the Acorn DNFS rom needed within a BBC Micro to support a second processor.

Watford DFS users are being offered a special swap deal. If they send in their old DFS the firm will supply them with a new one for £5.

The latest Watford DFS also auto selects between 40 and 80 tracks and has faster file handling. It costs £16.

SALES BOOST

ACORN has beaten off competition from IBM, Apple and Atari to win two major orders involving a total of 1,400 machines.

The Hong Kong government has bought 700 Master 128s for schools and training colleges in the colony. And closer to home, the West Glamorgan education authority has purchased 700 Master Compacts in a deal worth £300,000.

Acorn now reports sales of the Master 128 have topped 100,000.

MORE MODEMS

THREE new modems for the BBC Micro and Master have been launched by Mektronic Consultants.

All operate at 1200/75 baud, are BABT approved and have front panel controls and indicators.

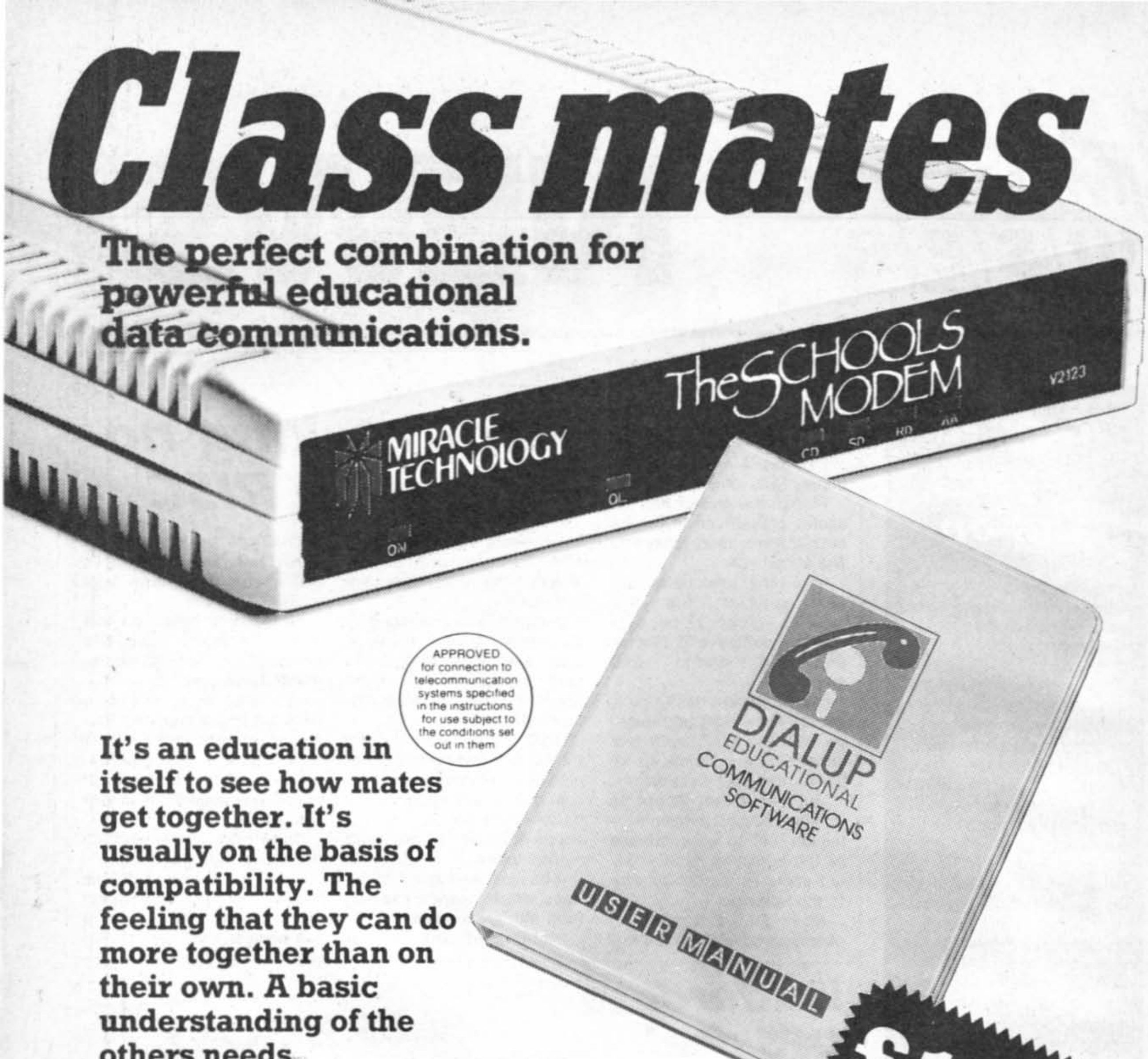
Model 1223 is line-powered and costs £78.25. It is available packaged with cable and comms software for £86.95.

Model 1223A features auto-answer and auto disconnect on command or on carrier loss, is line-powered and costs £139.

Model 1223B is mains powered, has auto-call and auto-disconnect facilities and costs £229.

Class mates

The perfect combination for powerful educational data communications.



APPROVED for connection to telecommunication systems specified in the instructions for use subject to the conditions set out in them

It's an education in itself to see how mates get together. It's usually on the basis of compatibility. The feeling that they can do more together than on their own. A basic understanding of the others needs.

All of which can be said about the teaming-up of the classy, intelligent V21/23 Schools Modem with the versatile DIALUP Educational software. A combination to create the strongest educational data-communications tool available today. A class relationship, designed for every classroom. Come and make friends — it'll be an education for you.

£199.95
+ carriage & VAT
(including free tutorial disk)

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& Scotland CONTACT:

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NEWS

The Link man

A KEY advertising executive with *The Micro User* has been appointed sales and marketing manager for its sister organisation, the rapidly-expanding MicroLink electronic mail service.

Mike Hayes . . . for him familiar territory

For Mike Hayes, aged 30, it is not a move into entirely unfamiliar territory.

After all, more than 30 per cent of all the subscribers to MicroLink are also readers of *The Micro User*.

In addition to this, an ever increasing number of the magazine's advertisers have switched to electronic mail as the most effective means of communication.

"As more than half my old clients had joined MicroLink in the last few months, I was well aware of the impact the service is having", said Mike Hayes.

"What we are witnessing is a revolution in the way people do business in this country.

"And MicroLink is at the forefront – thanks to a little help from the BBC Micro, which still happens to be the best machine around for communications".

But what finally persuaded Mike Hayes to take on his new role was the ever-increasing number of services available to MicroLink subscribers.

"Unlike its would-be competitors, it has so much more to offer than just electronic mail", he said.

"With additional facilities ranging from telex to being able to order airline, rail or theatre tickets – plus many hundreds of free telesoftware programs – MicroLink definitely has the edge on all the competition".

The very first MicroLink subscriber that Mike Hayes came into contact with in his new job just happened to be one of his former major advertising clients.

For Nazir Jessa of Watford Electronics now conducts a significant portion of his business on MicroLink.

"It was just as though I'd never left *The Micro User*", said Mike Hayes.

RED ALERT!

A NEW 160db warbling alarm is now available for use with the Red Box computer add-on home security system from General Information Systems.

The system, which runs on the BBC Micro, comprises a range of Red Box modules operating through the mains.

The modules include heat sensors, intruder alarms and deterrents, and controls for lights and domestic appliances.

Red Box home security system costs £163.95, additional Red Boxes sensors, alarms and controls cost £34.95 each.

Rapper rapped

A literary onslaught on the BBC Micro which appeared in the pages of a leading computer trade publication has resulted in a stinging rebuttal.

William Poel, whose company NewStar is closely associated with Amstrad, launched his attack in the pages of Microscope.

"The BBC Micro has done more harm to business in the UK than almost anything else in the past five years", he wrote.

"Surely the time has arrived to make a concerted effort to see schools relegate their BBC Micros to the infants, and insist that secondary education adopts the only standard (PC compatible machines) that future employers are the faintest bit interested in".

In a letter to Microscope, Nazir Jessa of Watford Electronics accused Mr Poel of inaccuracy and having a vested interest in promoting the sale of IBM compatibles.

"Remember that in 1981 the IBM PC had not been cloned", he wrote. "It sold for a fortune – well beyond the reach of schools – and was overpriced and under-powered.

"The BBC Micro was generally claimed to offer extraordinary value for money and could outperform an IBM PC.

Nor would the Watford chief executive accept Mr Poel's suggestion that BBC Micros are currently detrimental to schools.

Sophisticated range goes on show

THE Electron & BBC Micro User Show returns to the North at the end of this month.

Once again the Renold Building at UMIST, Manchester, is the venue for the latest event in the series which started way back in 1983.

It will be the 15th edition of the show that has never failed to delight and surprise micro owners with its wealth of new and exciting products.

And UMIST, from Friday March 20 to 22, will be no exception.

The show will reflect the increasing sophistication of the BBC range, whose Master and Compact machines are reaching new audiences in homes, offices and classrooms.

And the BBC Micro itself continues to grow more powerful and versatile, as will be seen at the Watford Electronics stand, to name just one.

Watford will be demonstrating its new Co-Pro Adaptor, a £50 interface which enables the Master 512k add-on board with Dos Plus to connect to the BBC Micro, thereby opening up the machine to Gem environment and hundreds of critically acclaimed software packages.

Care Electronics will be offering the plug-in Smart Cartridge for the BBC Micro and Master.

For under £50 it provides autosave, screen dump, tape to disc and disc to tape copying.

A version of Fontaid compatible with the Star NL10 printer is being launched by CJE Micros for the BBC Micro, Master and Compact.

The program allows the user to define a near letter quality character set which can be downloaded into the printer and used with any word processor. Price £30. Micro Media Computer Supplies is launching new copyholders – including an A3 version for books and magazines and a desktop model. Prices from £12 to £40.

Plus lots of entertainment programs from Shards Software, Tynesoft and others.

The latest Tynesoft sports simulation – boxing game Big K.O. – will be launched, price £7.95 on tape, £12.95 on disc.

More than 70 hardware and software suppliers will have stands at UMIST, where the doors are open from 10am to 6pm Friday and Saturday, 10am to 4pm Sunday.

A money-saving advance ticket order form appears on page 19 of this issue.

3½" 'COMPACT' versions of CJE software available £2 extra.

CJE micro's

ENHANCED!

ALL CJE MICRO'S SOFTWARE IS B, B PLUS, MASTER & MASTER COMPACT COMPATIBLE.

Multi-Font NLQ

NEW

Converts most printers to NEAR LETTER QUALITY
in user definable Fonts.

For EPSON & EPSON Compatibles, including MX/RX/FX/LX 80/100, STAR DP510/Gemini 10X/SG10/NL10 & Citizen 120D.

Simple to use, standard EPSON codes for Underline and Doublewidth used.

After initialising Multi-Font NLQ with a '*MFNLQ', Multi-Font NLQ is normally transparent to the user. Multi-Font does claim some memory for workspace and storing font data.
Multi-Font NLQ comprises of MFNLQ ROM for the BBC, and utility disc containing the FONT definer, ten fonts, BASIC demonstration program, VIEW demo text file and Driver.
Multi-Font NLQ is compatible with nearly all software, including most BASIC programs, VIEW, WORDWISE & InterWORD (SCRIBE & Printer Buffer software currently not supported).

Ten fonts are supplied or create your own using the font definer supplied.

Fonts included are:-
Standard NLQ, Courier, Italic, Gothic, CompTS, Bold, Shadow, Outline, Broadway E, Theatre

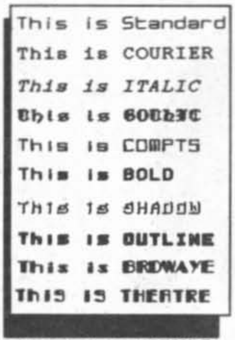
Additional Font Disc MF 'B' contains:-
Hand, Script, Stencil, Broadway, Caps, Italic-Plain, Meccano, Plain, STD large, Wire, Greek/Maths and Inverse.

For Canon & Taxan Kaga users we recommend FONTAID in preference to Multi-Font NLQ.

Multi-Font NLQ (ROM and 40/80 Disc)	**£30.00**
Additional font disc 'MF-B' (12 fonts)	**£15.00**
Additional font disc 'MF-C' (15 fonts)	**£15.00**
P & P on MFNLQ	**£ 1.00**

NEW

MASTER Write Protect and ROM select switch.
Two switches set to RAM slots to be:-
Internal ROM or RAM Read and Write or RAM Read only.
£15.00 inc VAT P&P £1.00


This is Standard
This is COURIER
This is ITALIC
This is GOTHIC
This is COMPTS
This is BOLD
This is SHADOW
This is OUTLINE
This is BRDWAYE
This is THEATRE

EXAMPLE OF MFNLQ FONTS

FONTAID

NLQ Definer for Canon & Taxan Kaga NLQ Printers.

Design your own NLQ Fonts or 'download' one of our 40+ predefined fonts.

Fonts can be downloaded within Wordwise, Inter Word or VIEW Documents allowing different fonts to be used for different paragraphs, or even individual lines of text. During downloading your Program or Text will not be corrupted.

On the FONTAID standard font Disk are the following eight fonts:- Square, Outline, Italic, Gothic, Computer Type Style, Bold, Shadow, and Broadway Engraved.

Additional disc 'A' gives an extra 11 fonts including:-
Greek/Maths, Plain, Hand & (Elite, Condensed, & Super Condensed).

Now included is a facility to issue '*' commands within a VIEW document.
To download new fonts within VIEW documents, the FONTAID ROM needs to be fitted in the BBC. (All other FONTAID facilities are available on both the FONTAID ROM & DISC). Fonts are always downloaded from Disc.

Fontaid is recommended to Canon & Taxan Kaga owners in preference to Multi-Font NLQ. As downloadable NLQ is a built-in facility of the Printer, full access to all the printers control codes is still allowed. The resolution of the FONTAID NLQ is also slightly higher than that of Multi-Font NLQ.

FONTAID requires 6264 RAM chip in printer.

FONTAID ROM & STD Font disc	(40 or 80 track)	**£30.00**
FONTAID ROM & STD Font disc with 6264 RAM	(40 or 80 track)	**£36.00**
FONTAID Additional Font DISC 'A' (11 fonts)	(40 Or 80 track)	**£15.00**
FONTAID Additional Font DISC 'B' (13 fonts)	(40 or 80 track)	**£15.00**
FONTAID Additional Font DISC 'C' (15 fonts)	(40 or 80 track)	**£15.00**

FONT ROMS of individual fonts are available eg "Square".	**£18.00**
P & P on FONTAID	**£ 1.00**

INFORM

A UNIQUE NEW POWERFUL USE FOR SIDEWAYS RAM

NEW

INFORM has been developed specifically to take full advantage of the Sideways RAM facility that many BBC micro users now have. Inform is compatible with most SIDEWAYS RAM units including ATPL Sidewise with RAM, Solidisc SWR, BBC B PLUS 128K & BBC MASTER series (not SDL256).

INFORM is a very powerful facility, which allows the user to display text information, of any kind, from Sideways RAM. This information can be readily accessed by using '*' commands from the keyboard or from application programs. In this way, much information can be displayed on the screen without stopping the current task, such as entering text in WORDWISE or VIEW.

The information in the RAM can be changed dynamically at any time.

Some of the possible applications for INFORM are:–

An on screen help manual can be created for your application, so that a reminder about more obscure points can be displayed at the users request. Information on your program or datafile contents, can remind you of their purpose.

Address and/or telephone numbers can be held and displayed quickly even while other applications are running. Very useful if you need to quickly display information about a client while he is hanging on the end of a phone!

Current prices for your products or stock position can be recalled instantly and readily modified using a wordprocessor. Similar files may be created from most databases such as VIEWSTORE.

In fact, any information to which you frequently refer can be displayed immediately without running another program. Your use of INFORM is only limited by your imagination, as they say!
There are three Inform Data Files (I.D.F.), of often used information, supplied on the disk to give an indication of the use of INFORM.

To use INFORM you must have Sideways RAM.

INFORM on 40/80 track disc. P & P on INFORM £1.00 **£20.00**

PRINTERS

NOW **FREE DELIVERY** on PRINTERS (by courier)

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Near Letter Quality Printers all with Centronics interface, Friction and Tractor feed.

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C.J.E. BBC Printer Packs are £15.00 cassette (£16.00 disc)
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CJE micro's

NEWS

Comms pack's launch

A COMMS package for users of the BBC Micro, Master 128 and Compact has been launched by Beebug.

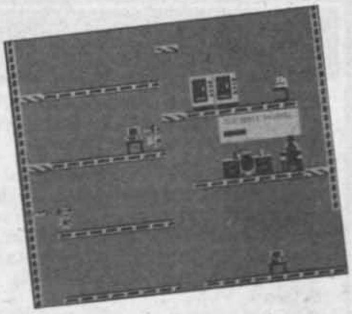
Command is available on rom and incorporates a viewdata terminal, Ascii terminal, viewdata editor and telephone directory. A 72 page manual is also included.

Also available is a facility to create bulletin board software. By using the program's 50+ BBC star commands, a five line program can be written to answer the phone, send a message and log off automatically.

Similar programs can be constructed for logging on to services such as MicroLink and downloading information automatically.

Command is now supplied with Beebug's Magic Modem, price £104. Alternatively the software may be bought separately, price £39.

It's all go on games



VERSIONS of two of its best-selling programs have been released for the BBC Micro by Ocean.

Daley Thompson's Supertest puts the user in the role of Thompson as he takes a break from the decathlon and indulges in his favourite pastimes, which include rowing and clay pigeon shooting.

Yie Ar Kung Fu II is set in Japan and follows Kung Fu Master Lee in his attempts to defeat Yenpei the only surviving member of the Chop Suey Gang.

Both new games are priced £8.95 on tape, £12.95 on disc.

* * *

TOP home computer chess program Colossus 4 Chess has at last been converted for the BBC Micro and Master.

The program, written by White Knight 12 author Martin Bryant, earned its reputation by defeating 24 others in a series of 16-game contests.

With its back-track facility, problem-solving mode and handicapping feature, Colossus 4 Chess performs as a tutor for beginners and a strong opponent for experienced players. Price £9.95 on tape, £14.95 on disc.

* * *

SPACE is the setting for War, the latest release for the BBC Micro, Master and Master Compact from Martech.

Users are in control of a spacecraft which skims across the surface of an alien world. Attacking craft must be wiped out before the planet can be destroyed.

Five levels of play are incorporated. Price £8.95 on tape, £12.95 on disc.

A FEW FONTS FURTHER

A SERIES of fonts for use with its Wordpower word processor has been released for the BBC, Master and Master Compact by Ian Copestake Software.

Power Fonts allows full control over extra characters for foreign languages and science.

Subjects include Cyrillic, Greek, Physics and Astronomy. Each is priced £24.50.

Also available is PowerFont NTQ, a special version of the Permanent Memory Systems' package Multi-Font NTQ.

Handling up to 190 characters at a time the program allows a high-quality printout to be produced in a variety of sizes – even when mixing two alphabets. Price £35.

PRICE reductions on its ADFS compatible Winchester units and E-Net BBC network have been announced by Amcom Software.

The Amcom 20mb ADFS Winchester is now £650, and the Amcom E-Net Winchester £1,200 including fileserver software.

THREE YEARS AGO

THE MICRO USER

ANOTHER look back at what the Micro User covered three years ago. This was the issue for March, 1984.

The BBC Micro is taking the United States by storm. Acorn has reaped in excess of $50 million worth of business in just six months. This means that it has beaten its first year target figure by $10 million with six months still to go.

* * *

Acorn has also hit out at speculation over the future of its contract with the BBC to market the BBC Micro. Reports have suggested that the company may lose out to a competitor when its agreement comes up for renewal in August. An official statement has been released and claims that the two organisations are "working towards the renewal of the marriage vows, not a divorce".

* * *

A series of five exhibitions sponsored by *The Micro User* and its sister publication *Electron User* are expected to attract more than a quarter of a million people this year. Four of the shows are to be held in London and one in Manchester, all under the banner of "The Electron and BBC Micro User Show".

* * *

Two new micro oriented television series have been announced by the BBC for 1984. "Computers In Control" will give an introduction to robotics, monitoring and control applications using the micro. "Electronic Office" will attempt to explain the revolution in office technology and a book is also planned to accompany the fascinating series.

* * *

Hermann Hauser, joint managing director of Acorn has won a computer industry Oscar. The RITA award was presented to him as personality of the year.

NEW BBC PRODUCTS FROM CLARES

Enhanced BETA-BASE £25

40 80 3"

SPECIFICATION

1) Random Access	- disc based, single or dual drives
2) File Size	- max 65,000 records
3) Record Size	- up to 2048 characters and 200 fields
4) Field Size	- up to 254 characters
5) Holds	- approx 1200 ADDRESS records per 100k
6) Search	- 5 search fields using powerful options
7) Sort	- 500 records on 3 fields in 60 seconds.

SYSTEM FEATURES

*CALCULATE - using any valid expression
*PRINTOUT - Powerful options
*REDEFINE - Titles, fields etc.
*TRANSFER - From one file to another
*GLOBAL ENTRY - of repetitive data
*SEARCH LISTS - Allow creation of sub Databases within main Database
*SPOOLER - enables you to create spooled files that are compatible with Wordwise, View etc.
*INPUT - is a routine included on the disc which will allow you to write your own utilities for accessing your data. Many of the programs on the utilities disc were written using this procedure

BETA-BASE UTILITIES £12.00

40 80 3"

Extend the power of Beta-Base with the extra facilities provided on this disc.

*MAIL MERGE
*LABEL PRINTER
*DISC SORT
*EXTENDED SEARCH
*FREE FORMAT TRANSFER
*FAST PACK
*STATUS

The MAIL MERGE alone is worth £12 so you get a real bargain with this disc. The features are so numerous that we cannot mention them all here.

Ask for our UTILITIES DATA SHEET if you want more information.

40 80 3" ——— DISC
40 ——— 40 TRACK
80 ——— 80 TRACK
3 ——— 3" DISC - ADD £3
——— EPROM

Send for detailed newsletter
All prices inclusive of VAT & Carriage - NO EXTRAS! Please state 40 or 80 track disc and state D.F.S. you use.

FONTWISE PLUS £20.00

40 80 3"

FONTWISE PLUS is now compatible with VIEW, MINI OFFICE II, EDWORD 2 and INTERWORD as well as WORDWISE and WORDWISE+!

Now you can have PROPORTIONAL and JUSTIFIED text in 12 different fonts, all within the same document if required. In addition to the standard facilities like line and page length, pagination, left margin etc. we have now added

- Enlarged, standard & condensed fonts
- Tabs
- Temporary indent
- User definable line feed
- User definable character spacing
- Non proportional fonts
- Now with 12 fonts
- Plus many more features

If you are not convinced ask us to send you a sample printout and you will be amazed at the quality - requires an EPSON compatible printer capable of single, double and quad density graphics but you do not require any RAM in your printer to use FONTWISE PLUS.

MACROM £40 £35 DISC

40 80 3"

MACROM is a fast full featured MACRO ASSEMBLER ROM that allows the use of macros, which are loaded from a macro library stored on disc. Assembly can be from disc to memory, disc to disc, memory to memory or memory to disc, thus allowing the use of very long source code up to the length of your disc. MACROM source code is tokenized and thus takes up far less room in memory or on disc than most assemblers.

- Operate in any mode
- Tokenized source code
- Assembles 6502 & 65C02 codes
- Automatically loads macros from library on disc
- Automatically loads subroutines from disc
- Macro library supplied plus demo files
- Chain program sections into main code
- Many different assembly options
- Converts BBC assembler code into MACROM source code
- Very fast & very flexible

In a comparison with ADE, MACROM was able to assemble a program to disc in 1 min 24 secs compared to 5 minutes with ADE and the source code took up 30% less room on the disc.

Ask for a data sheet today

RAMROD £40 ROM £35 DISC

40 80 3"

RAMROD is the ultimate in toolkit ROMs and is fully compatible with the whole BBC range from Model B through to the MASTER 128 and including both 6502 and TURBO co-processors. RAMROD adds 54 new commands to your computer. Areas covered are DISC (DFS & ADFS), GENERAL (memory commands etc.), ROM (including sideways RAM) and TUBE.

RAMROD provides commands to dump memory or a disassembly of memory to a printer. Editors can display the screen in 40 or 80 column mode.

DISC

Edit discs and search for ASCII or HEX sequences.

GENERAL

Edit, search, disassemble, compare, dump to printer and relocate ANY area of memory including the SHADOW screen. List vectors in use, load and save function keys even on MASTER etc.

In addition to the above you can move between ROM/RAM banks using (CTRL) Cursor Keys when in either memory or disassembly mode PLUS you can switch between memory editor and disassembler by pressing (CTRL)(TAB).

ROM

Includes commands for listing, loading, saving, wiping, swapping, ROM images. PLUS formatting and titling RAM banks for the ROM filing system and saving programs in RFS format.

TUBE

Provides the same memory commands as GENERAL plus SHIFT and COMPARE memory across the TUBE both ways.

We cannot do justice to RAMROD in the space here so please ask us to send you a fuller data sheet - RING NOW!

NEW PRODUCTS

Watch out for a fabulous new product which will be released during SEPTEMBER for the MASTER and its compatibles.

This is a high quality art package called ARTROOM but it offers many features not provided elsewhere. It is a full screen package and is written by the authors of FLEET STREET EDITOR so you know that it will be good.

Ask for a data sheet NOW!

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2200 SS	3.00	2.60	2.40
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Discs with 15ml cleaning solution

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Centronics lead to connect BBC to Epson Kaga Canon etc.

1 MTR 6.30 2 MTR 8.50

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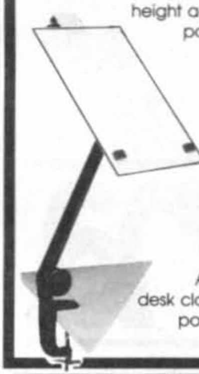

A4 Adjustable desk clamping. Plate positioned 360°.

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Printer Stands

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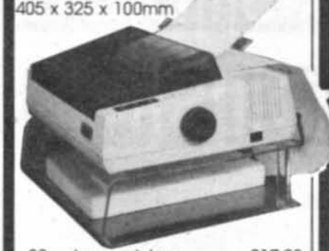
405 x 325 x 100mm



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132 column printers	£24.90

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Lifetime Guarantee/label sets

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DS/DD	19.00	18.00	17.00

3M 5¼" Lifetime Guarantee

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DS/DD 40	12.80	12.40	12.00
DS/DD 80	17.70	17.00	16.50

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SS/DD	20.50	20.00	19.00
DS/DD	27.50	27.00	26.00

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SS/DD 40	11.70	11.40	11.10
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Continuous fanfold, sprocket fed

Price per 1000	1,000	2,000
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89x36	4.30	3.90
89x49	5.90	5.30
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	1,000	2,000
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89x36 2 across	6.60	6.30
102x36 2 across	6.70	6.40

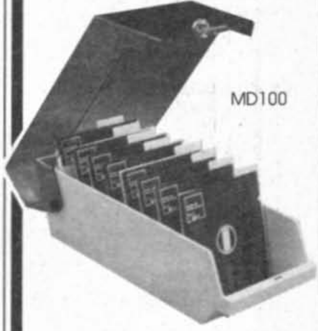
Computer paper

Plain fanfold, micro perf edges

Size	Weight gsm	1000's per box	Price per box 1 box	2 bxs+
11x9½	60	2	12.50	11.80
	80	2	15.50	14.20
EXACT A4				
11⅔x9¼	70	2	20.90	18.50
	90	1	13.20	11.00

A4 Fixed tractor paper available

MM100
Lift off lid



MM50
Lift off lid

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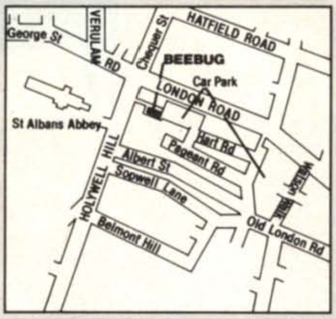

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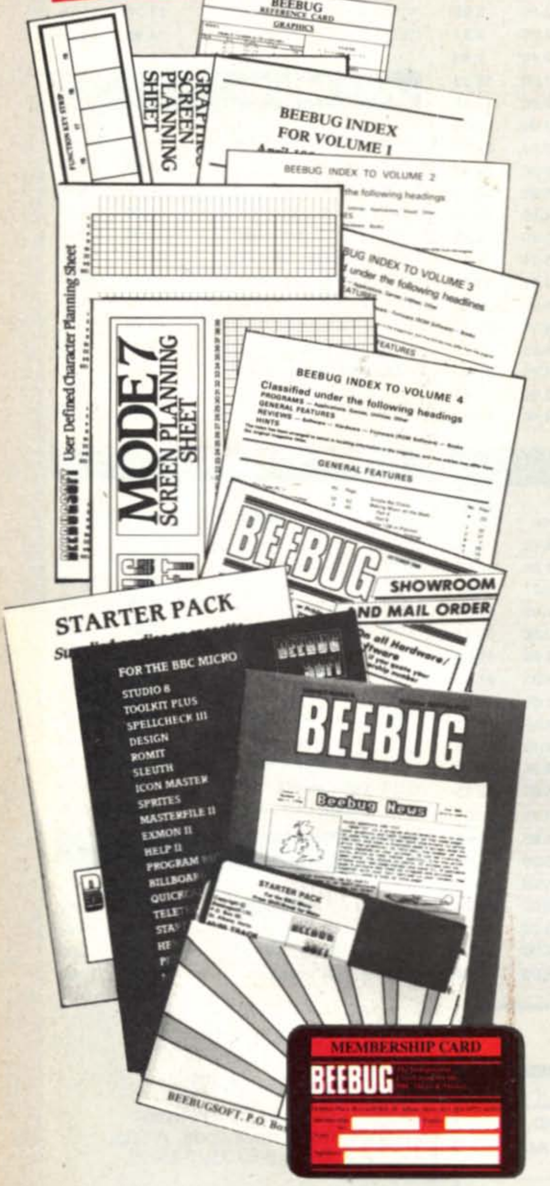

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Tools of the trade: A Very pistol, walkie-talkie and the micro's specially written statistical data analysis program

BBC Micro in fight against bird strikes

Mike Cowley visits the Bird Man of Manchester Airport

THE solitary BBC Micro to be found in the runway tower overlooking Manchester Airport is strictly for the birds.

Flanked by rows of gleaming new IBM PCs charting aircraft progress, the rather elderly machine looks somewhat out of place.

But the role it plays is vital to the safety of the seven million passengers who now pass through the terminal annually.

For the three-year-old micro is the nerve centre of the only operation of its kind in the field of civil aviation in the UK – the Bird Control Unit.

It acts as the logistical headquarters for an ongoing struggle being conducted by the Manchester International Airport Authority.

And the goal of this is to reduce the risk of aircraft crashing or being damaged as a result of bird strikes.

Such has been the impact of the BBC Micro on the project that the incidences of birds colliding with planes has been cut by almost half in the last 12 months.

Using a specially written statistical data analysis program, the machine has designed a world-beating bird control system based on behavioural and ecological observations.

And this is highly significant in the terms of aircraft safety, for bird strikes present a potentially far greater problem than most people appreciate.

Birds have bumped into aircraft throughout aviation history, the first recorded human fatality due to this phenomena being back in 1912.

But with the substantial increase in airline traffic of late, the risk factor has increased a thousandfold. Today on average one aircraft crashes every 18 months as a result of a bird strike.

And the damage caused by incidents involving birds now costs the aviation industry tens of millions of pounds annually.

While the majority of these collisions cause little or no damage, every one is recognised as having disaster potential.

Back in 1960 a Lockheed L188 Electra crashed in Boston, USA, with the loss of 62 lives after being involved in a mid-air collision with a flock of starlings.

Much more recently a Boeing 747 moving at 95mph down the runway at Charles de Gaulle Airport had to abort take-off when it ran into a flock of seagulls. A subsequent inspection revealed that two of the airliner's four engines had been seriously damaged.

Here in the UK, an average of four to five bird strikes are reported for every 10,000 take-offs. And this figure is considered to be most conservative due to limitations of reporting procedures.

A breakdown shows that some 16 per cent of these are dangerous in that they involve an aircraft engine.But the most hazardous situation of all – multiple engine strikes – occurs only once in every 200,000 movements.

It is understandable then that airline officials, increasingly concerned with safety, have been carefully monitoring the situation.

One Japanese airline, All-Nippon Airways, has decided to tackle the problem by painting intimidating birds' eyes on the engine intakes of its fleet to frighten away real birds.

But the Europeans are using a less exotic approach in that they are calling on the services of ornithologists.

Schiphol Airport in Amsterdam now boasts five full-time bird men. The first and only British civil airport to follow this example to date is Manchester.

Some 18 months ago it set up its Bird Control Unit under the direction of zoologist Dr Callum Thomas. And because of the vast task that confronted him, Dr Thomas in turn called on his own BBC Micro for back up.

"I am using the machine on which I wrote my PhD", he says, "and it is more than adequate for the task".

But BBC Micro or not, the project would never have got off the ground without the expert known around Manchester Airport as "the bird man".

Callum Thomas graduated from the Imperial College of Science and Technology, London University, with a degree in zoology in 1976.

An Associate of the Royal College of Science, he obtained his doctorate at Durham University studying the breeding habits of birds.

He then happily spent the next five years poking about rubbish tips to investigate aspects of the ecology and behaviour of gulls wintering in North East England.

During this time, he published a number of scientific papers and has lectured in Britain and abroad on bird behaviour.

Based at the airport, he can be found wandering around in his wellies from dawn to dusk, peering out from behind round wire-rimmed glasses as he looks for dead birds.

For dead birds to him – like dead bodies to policemen – tell a tale.

"It isn't difficult to see if they've been in collision with an aircraft", he says, "and if they have then their details are logged on the BBC Micro.

"We also include data on the species involved which the micro collates to provide a picture of the frequency of which a particular type of bird is involved.

"From this we have already established that not all birds are equally strike prone".

Data is also fed into the BBC Micro from forms that have to be filled in by pilots involved in a bird strike or by ground personnel who find evidence – such a blood and feathers during aircraft overhaul.

Bird remains, no matter how small, are also scrutinised to establish type.

"Each airport has its own unique bird problem arising from its geographic location, the local bird population and the geography of the airfield", says Dr.Thomas". A full understanding of these factors is necessary in order that an effective bird control programme can be followed".

Vital data

Visual observations carried out by Dr. Thomas and his helpers – and subsequently fed into the BBC Micro – have revealed that one third of all bird strikes at Manchester involve gulls, one third lapwings and 17 per cent swallows, swifts and house martins.

And most incidents occur in the winter months around about dawn.

Research into why they are at the airfield has elicited four main reasons – to feed, to rest, to sleep or to breed.

"By observing the birds it is possible to discover exactly what it is about the airfield which attracts them", explains the Bird Control Officer, "and also what it is about their behaviour which makes them more likely to get struck".

Gulls, it has been discovered, use Manchester Airport primarily as a feeding site, lapwings as a rest area, while swallows, swifts and house martins divide their time between feeding and breeding there.

Having identified why birds go there, Dr. Thomas has been examining ways to make the site less appealing to them, in particular ensuring that there are no sources of food.

As it has become known that gulls enjoy feeding on worms washed on to the runway by heavy rain, one answer to this was to treat a strip of grass on each side of the runway.

However the major breakthrough to date came when the BBC Micro helped identify that keeping grass at the airfield about eight inches long would prove a significant deterrent. For long grass, it has now been proved, is avoided by birds as it makes it impossible for them to spot approaching predators while they are feeding.

Scaremongering

The computer was also called upon to analyse the effects of bird-scaring techniques. Unfortunately, the best of these – harassment by firing Very pistols with bird-scaring cartridges as used at Manchester – has limited results. "The trouble is they come back", says Dr. Thomas.

And even broadcasting tapes of birds in distress is far from being totally effective.

Scarecrows are of little use, as after a time birds tend to sit on them. Even computerised models which wave their arms can cause additional problems by frightening birds so much they'll actually fly into the path of aircraft.

Some military airfields have come up with an answer in the form of hawks. But as these can only be flown when there are no aircraft landing or taking off, they are of little use at busy civil airports.

"We have now reached a stage where scope for further improvement on our airfield itself is limited", says Dr. Thomas. "So now we are busy identifying other sites in this area which influence bird hazards here".

With the help of the Manchester School of Flying, the zoologist has been tracking flocks of birds which regularly pass over the airport.

"As a result, we have been able to plot their feeding and resting grounds for several miles around – up to eight miles is considered the danger zone – and hopefully we can do something about them".

One of the courses of action Dr. Thomas is able to take is to oppose any new rubbish sites in the immediate area of the airport.

"We monitor planning applications carefully and are quick to make our views known if the end result is likely to provide fresh feeding grounds to bring birds closer to the runways.

"I've also made some recommendations to the authorities regarding landscaping locally. For we must go out of our way to prevent new hazards like crops of new trees which in 20 years time might become a starling roost".

Despite all this, Dr. Thomas admits there is no foolproof method keeping birds and aircraft apart.

"It is my belief that we will only be able to develop efficient and long lasting methods of control if we understand the reason why the birds are attracted to airfields", he insists.

"A prerequisite to this understanding will be continuing scientific studies of the behaviour and ecology of the birds themselves.

"We can only hope that one day as a result of the work, the BBC Micro will come up with a definitive answer . . ."

Is it a bird? Is it a plane? Dr Callum Thomas is aided in his task to keep the two apart by his trusty BBC Micro

INTER WORD

The integrated word processor for the BBC micro

INTER-WORD is fast, efficient and simple to use. Being menu operated the newcomer does not need to remember strange key combinations or command names. The menus are not a burden to the experienced user since there are shortcuts to access many of the features.

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"INTER-WORD is the most powerful and comprehensive word processor available for the BBC today. It is more powerful and flexible than View and still retains much of the friendliness and ease of use of Wordwise. Inter-Word looks set to become the standard word processor for the BBC Micro."

Beebug, Aug/Sept '86

Inter-Word is part of the 'ROM Link' series which is the only truly integrated suite of ROMs for the BBC micro.

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• Block operations

These are common to most word processors, but with INTER-WORD any part of the text can be marked and then instantly moved, copied, deleted, printed, saved, underlined etc. There is no limit to the amount that can be marked.

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A more detailed specification is available upon request

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A strange case from
the secret dossiers
of Mark Smiddy

Solve the birthday party riddle

AS you, Sherlock Holmes, are taking a quiet evening stroll, you pass a detached well-lit house set back from the road. Suddenly a terrible scream rends the night. Quickly you investigate and discover that at *The Micro User* birthday party, a crime has been committed.

The criminal has been caught but refuses to say what he took or what he did with it. He will only give you cryptic clues.

You decide to find out what the villain has taken, so you take him into a side room and start to question him yourself.

Before you the devious devil lays out a series of ? cards on the table and looks at you expectantly, with a curious smile on his face. You begin to ask him questions, such as:

```
Can I eat it?
Would I unwrap this?
Is it in the study?
Is it sort of round?
Could I wear it?
Would it be wrapped?
```

And each time the question is relevant he removes some of the cards. The number of cards remaining on the table indicates how close you are to knowing what the object is. When you know the object that the villain used, you can shout its name followed by an exclamation mark.

```
IT IS A CANDLE!
```

The computer will accept the words shown in the table and you can remind yourself of these by typing HELP.

At the start of the game you can set a clue level from hardest, 1, to easiest, 9. This controls the number of acceptable words the computer will display when you type HELP.

You will find it easier if you try to find the room first. Write down all your answers and keep track of what you ask. The villain will never lie, but may sometimes be vague. If only one card is left facing up you should know what the object is. The lower your score, the better. ■

WORDS RECOGNISED

Rooms	Hall, Study, Lounge.
Verbs	Eat, Play, Small, Big, Wear, Wrap, Round, Blow, Pull, Light.
Nouns	Cake, Jelly, Ball, Parcel, Sweet, Card, Cracker, Balloon, Candle, Hat.

MAJOR VARIABLES

Q$	Your input.
Q%	Keywords token, 13 if not found.
coms	Total number of possible commands, 15 at present.
tries%	Number of goes it's taken you.
obj%	Number of current object.
obj$	Name of current object.
card%(n)	Thirty numbers all mixed up.
facts%(n,n)	Answer data on an object.
N%,I%,J%,S%	Work variables
X%,Y%	Graphics temporary coordinates

MAJOR PROCEDURES

shuffle	Shuffle the cards.
many_squares	Draw cards.
square	Draw one card.
query	Get your input and interpret it.
any_room	Handle the rooms.
question	Give an answer.
solved	Has it been cracked?
init	Initialise the arrays and other set up.
table	Draw the card table.
help	Give some help at easy levels.

```
  100 REM MICRO USER Birthday game
  110 REM (c) The Micro User
  120 REM Program by Mark Smiddy
  130 REM Graphics by Guilder
  140 MODE 1:PROCinit
  150 REPEAT PROCshuffle
  160 REPEAT *FX15,1
  170 PROCmany-sqquares:PROCquery
  180 PROCany-room:PROCquestjon
  190 UNTIL Q%
  200 PRINT"Another game perhaps?"
  210 G=GET AND &DF:UNTIL G=78
  220 PRINT"Bye bye!":END
  230 DEF PROCquery
  240 COLOUR 129:PRINT">";:COLOUR128:COL
OUR3:INPUT" "Q$:Q$=Q$+STRING$(10," ")
  250tq$="":FOR I%=1 TO LENQ$:B%=ASCMID$
(Q$,I%,1):IF B%<>ASC"!" B%=B%AND&DF
  260 tq$=tq$+CHR$B%:NEXT:Q$=tq$
  270 tries%=tries%+1
  280 Q%=0:REPEAT Q%=Q%+1
  290 UNTIL (Q%=max OR INSTR(Q$,com$(Q%)
)<>0) OR (INSTR(Q$,obj$)<>0 AND INSTR(Q$
,"!")<>0)
  300 IF INSTR(Q$,"!")<>0 PROCsolved
  310 IF INSTR(Q$,"HELP")<>0 PROChelp
  320 IF Q%=max PRINT"Please get to the
point Holmes.":Q%=0
  330 ENDPROC
  340 DEF PROCsolved
  350 IF INSTR(Q$,obj$) IF C%=0 CLS:PRIN
T"Sorry Holmes, you forgot....""Where w
as it hidden?":Q%=-1:ENDPROC
  360 IF INSTR(Q$,obj$) IF C%=1 CLS:PRIN
T"Well done Mr Holmes,""you solved the
mystery!""Do have some tea.":Q%=-1:S%=t
ries%*clue%:PRINT"You score:";S%
  370 IF S%>0 AND S%<15 PRINT"Jolly good
 show.":ENDPROC ELSE IF S%>0 ENDPROC
  380 PRINT"Sorry Holmes, that's not it.
""Only Smarties have the answer!":Q%=-1
  390 ENDPROC
  400 DEF PROCquestion
  410 P%=0:IF Q%>coms OR Q%<4 ENDPROC:EL
SE Q%=Q%-3
  420 X%=((obj%-1) MOD 10)+1
  430 A%=facts%(X%,Q%):IF A%=1 PROCerase
:P%=1 ELSE P%=0
  440 IF A%>clue% A%=0
  450 PRINTans$(A%):Q%=0
  460 ENDPROC
  470 DEF PROCerase
  480 FOR N%=1 TO 30
  490 X%=((card%(N%)-1) MOD 10)+1
  500 IF facts%(X%,Q%)<>1 card%(N%)=0
  510 NEXT:ENDPROC
  520 DEF PROCany-room
  530 IF Q%<=0 OR Q%>3 ENDPROC
  540 IF ((obj%+9) DIV 10)=Q% PRINT"Yes,
 it is!":P%=1:PROCno-room:PROCmany-squar
es:ELSE PRINT" No, I'm afraid not.":P%=0
  550 Q%=0:ENDPROC
  560 DEF PROCno-room
  570 Q%=Q%*10:C%=1
  580 FOR I%=1 TO 30
  590 IF card%(I%)<Q%-9 OR card%(I%)>Q%
card%(I%)=0
  600 NEXT:ENDPROC
  610 DEF PROCmany-squares
  620 IF P%=0 ENDPROC
  630 N%=0:FOR X%=96 TO 1152 STEP 190
  640 FOR Y%=500 TO 1012 STEP 122
  650 N%=N%+1:IF card%(N%)=0 S%=96:PROCs
quare(X%,Y%,3,0):S%=80:SOUND 0,-10,6,1:P
ROCsquare(X%+4,Y%-4,0,3) ELSE S%=96:PROC
square(X%,Y%,3,0):S%=80:PROCsquare(X%+4,
Y%-4,3,3):SOUND 1,-10,6,1
```

▶

◄

```
  660 NEXT:NEXT:ENDPROC
  670 DEF PROCsquare(X%,Y%,C1%,C2%)
  680 X%=X%+12:GCOL 0,C1%:MOVE X%,Y%:MOV
E X%+S%,Y%:PLOT 85,X%,Y%-S%:GCOL 0,C2%:M
OVE X%,Y%-S%:MOVE X%+S%,Y%-S%:PLOT 85,X%
+S%,Y%
  690 IF card%(N%)<>0 IF S%=80 MOVE X%+3
2,Y%-32:GCOL 0,1:VDU5,ASC"?",4:MOVEX%,Y%
-80:DRAW X%,Y%:DRAW X%+80,Y%:GCOL0,1:DRA
W X%+80,Y%-80:DRAW X%,Y%-80
  700 ENDPROC
  710 DEF PROCtable
  720 GCOL 0,129:VDU24,0;384;1276;1020;1
6
  730 GCOL 0,2:MOVE 16,400:MOVE 16,1008:
PLOT 85,1264,1008:MOVE1264,400:MOVE 16,4
00:PLOT 85,1264,1008
  740 ENDPROC
  750 DEF PROChelp
  760 Q%=0:IF clue%<4 PRINT"No help on t
his level.":ENDPROC
  770 I%=0:REPEAT J%=0:REPEAT
  780 I%=I%+1:J%=J%+1:PRINTcom$(I%);:IF
I%<coms PRINT", ";:ELSE PRINT".";
  790 UNTIL J%=5 OR I%=coms:PRINT
  800 UNTIL I%=coms
  810 IF clue%<=7 ENDPROC
  820 I%=0:REPEAT J%=0:REPEAT
  830 I%=I%+1:J%=J%+1:PRINTobj$(I%);:IF
I%<10 PRINT", ";:ELSE PRINT".";
  840 UNTIL J%=5 OR I%=10:PRINT
  850 UNTIL I%=10:ENDPROC
  860 DEF PROCshuffle:CLS:*FX15,1
  870 PRINTTAB(10,1)"Sherlock Holmes"TAB
(7,3)"and the Birthday Party":PRINTTAB(1
0,5)"Any key to start.":G=GET:CLS:PRINT"
Please wait while I shuffle!"
  880 FOR I%=1 TO 30:card%(I%)=I%:NEXT
  890 FOR I%=1 TO 29:FOR J%=1 TO 29
  900 IF RND(2)=1 swap%=card%(J%):card%(
J%)=card%(J%+(30-J%)):card%(J%+(30-J%))=
swap%
  910 NEXT:NEXT
  920 obj%=RND(30):C%=0:Q%=0:P%=1:S%=0:t
ries%=0
  930 obj$=obj$(((obj%-1) MOD 10)+1)
  940 INPUT"Enter your clue level 1-9:"c
lue%:IF clue%<1 clue%=1 ELSE IF clue%>9
clue%=9
  950 CLS:PRINT "Ok, Sherlock...""It's
up to you now!""Ask away....."
  960 ENDPROC
  970 DEF PROCinit
  980 COLOUR 3:COLOUR129:GCOL0,128
  990 VDU 28,1,31,38,21,12,24,44;16;1224
;336;16:COLOUR128:VDU 28,2,30,37,22,12,1
9,1,1;0;19,2,2;0;19,3,7;0;
 1000 PROCtable
 1010 G=RND(-TIME):coms=15:max=coms+1
 1020 DIM facts%(10,coms-3),card%(30),co
m$(max),obj$(10),ans$(8)
 1030 FOR I%=0 TO 8:READ ans$(I%):NEXT
 1040 FOR I%=1 TO max:READ com$(I%):NEXT
 1050 FOR X%=1 TO 10
 1060 READ obj$(X%)
 1070 FOR Y%=1 TO coms-3
 1080 READ facts%(X%,Y%)
 1090 NEXT:NEXT:ENDPROC
 1100 DATA "No","Yes","Yeuch!","That wou
ld be messy!","Perhaps?","Tricky!","No.
It's paper, silly.","No way, that would
go BANG!","Pheeeeeooww! Nothing happens.
"
 1110 DATA STUDY,HALL,LOUNGE,EAT,PLAY,SM
ALL,BIG,WEAR,WRAP,ROUND,SQUARE,LIGHT,BLO
W,PULL,KICK,???
 1120 DATA CAKE,1,3,0,1,3,0,1,0,0,8,0,3
 1130 DATA JELLY,1,3,1,0,3,0,1,0,0,8,0,3
 1140 DATA BALL,2,1,0,1,5,0,1,0,7,8,0,1
 1150 DATA PARCEL,2,0,0,1,5,1,0,1,6,8,0,
0
 1160 DATA SWEET,1,0,1,0,0,4,1,0,0,8,0,0
 1170 DATA CARD,2,0,1,0,0,0,0,1,6,8,0,0
 1180 DATA CRACKER,2,1,1,0,0,4,1,0,6,8,1
,0
 1190 DATA BALLOON,2,1,0,1,0,0,1,0,7,1,0
,0
 1200 DATA CANDLE,2,0,1,0,5,4,1,0,1,1,0,
0
 1210 DATA HAT,2,4,0,1,1,0,1,0,6,8,0,0
```

This listing is included in this month's cassette tape offer. See order form on Page 159.

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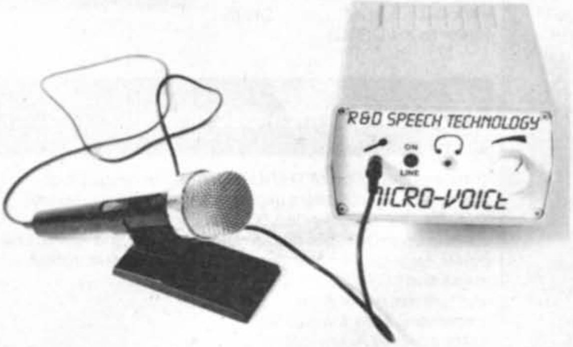

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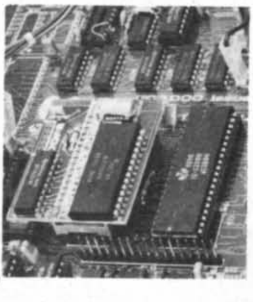

Solidisk very popular Double Density Disc Filing System (DDFS) is based on the WD-1770 floppy disc controller, the same chip used on the Beeb-Plus and the Master series, totally hardware compatible with Acorn 1770 DFS and ADFS ROMs. The DDFS is suitable for virtually any type of floppy disc drives, 3½" and 5¼", 40 track and 80 track, single and double-sided with or without power supply unit. New low price without DFS ROM .... £35.00 (order as XR/DDFS)

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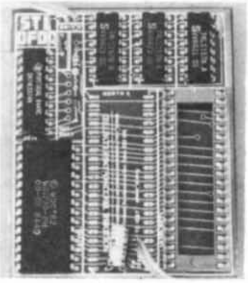

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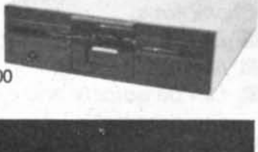
Unbeatable quality 5 and ¼ inch disc drives

Also available are NEC or MITSUBISHI 5 and ¼ inch, 80 track, double-sided drives at a very attractive price. Cased in matching cream colour, all leads. Only £109.00



Free bridge unit for twin drive systems

If you pay for two drives on a single order, we will offer you, absolutely FREE this practical BRIDGE unit. Solid steel construction, suitable for all Models of BBC and Master 128K.

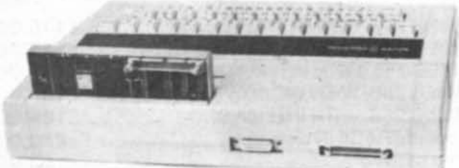
SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (16 lines).

SOLIDISK AUTUMN SALE

Electron Disc Interface:

This unit (EFS) plugs into the PLUS-1 Expansion and allows connection of a twin disc drive system and a Winchester. The Disc Interface is based on the same WD1770 chip as used on the Beeb. The Electron Disc Filing System software in ROM (32K) is a version of the Solidisk ADFS 2.1 thus offers a large degree of compatibility with Beeb software. The system is capable of both Beeb DFS format (single and double density) and ADFS format as used on the Acorn PLUS-3. The unit also has a 16K of Sideways RAM which can be used to load ROM images. The unit is guaranteed for one full year but we warn the users that the built-in Sideways RAM is UNRELIABLE hence the reduced price of only: .... £50.00.

Use a disc system with built-in power supply unit.



Old Style SWR32 and 128K:

This exceedingly popular system (30,000 plus units sold) enables the Beeb user to load one or two ROM images into the Beeb, make a 16K printer buffer, use DFS with PAGE at &E00, play games, run bigger BASIC, store music and inumerable other uses as supported by a library of 15 software diskettes.

The SWR32 system consists of a BASE UNIT which plugs into the rightmost ROM socket on the BBC board and a (exchangeable) RAM CARD. The RAM CARD also has extension socket for a piggy-back memory board capable of bringing the extra memory to 128K bytes of RAM.

This system is now superseded by the new FOURMEG series and therefore offered at a knock-down price of ONLY £20.00 for a complete unit, excluding software. The 96k add-on piggy-back memory board is also greatly reduced.

Order as SWR32 .... £20.00

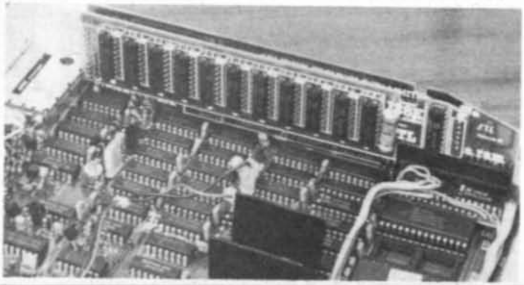
Order as SWR128 (SWR32 with 96K extension) . £50.00

NB: Manual supplied but software (not strictly required) not included.

The supportive software is a series of 15 diskettes, available on either 40 or 80 track DFS diskettes. You can buy any number of VOLUMES although we recommend you buy by PACK of FIVE volumes. PACK 1 (volumes 1 to 5) contains general applications such as MENU, PRINTER, DFS0E00, SILEXICON etc. PACK 2 contains programming applications (SOLIMON, SOLITRACE, TELETEXT EDITOR, SPRITES, DFS and ADFS etc). PACK 3 contains exclusively computer games. Each diskette is priced at only £2.00, software PACK is £10.00 for 5 diskettes.

Order as VOL. XX £2.00

Order as SOFT/PACK 1 or 2 or 3 .... £10.00



Secondhand Refurbished Beebs:

As a result of the Solidisk MASTERPLAN, we have to dispose regularly of SECONDHAND, refurbished, complete with Double Density DISC INTERFACE, thoroughly checked and fully guaranteed (Labour only) BBC Model B's. Price vary with issues and ages, commencing from £150.00. Please ring for brochure.

In Brief:

The range of Solidisk Add-Ons for the Beeb is quite extensive. For example: TWOMEG-32K . . . £50.00, FOURMEG-32K . . . £70.00, SWR64 with S/W pack 1 . . . £60.00, SWR128 (new style) with S/W pack 1 . . . £80.00, FOURMEG-256K with WORDWISE PLUS . . . £175.00, DDFS (1770) . . . £35.00, DFDC (1770+8271) . . . £40.00, DFS 2.2 ROM . . . £15.00, ADFS 2.1 ROM set . . . £30.00, 3½ inch (80 track double sided) drive . . . £90.00, 5¼ inch drive . . . £109.00, 20MB Winchester with PSU . . . £745.00, Linemaster communication ROM . . . £10.00, Insight intelligent disassembler ROM . . . £15.00, Solimon machine code monitor ROM . . . £10.00, Toolkit ROM . . . £10.00, S/W pack (1 to 3) of 5 discs . . . £10.00, 2764 EPROM . . . £1.00 each, 27128 . . . £3.00, 27256 . . . £6.00, EPROM programmer for 2764/27128 . . £19.00, EPROM programmer for 27256 . . . £21.00, EPROM Eraser . . . £20.00.

Order Form

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ADD post and packing **£2.00**
(£3.00 for disc drive)

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Solidisk Technology Ltd
17 Sweyne Avenue, Southend-on-Sea
Essex SS2 6JQ

We reserve the right to change prices and specifications without notice for improvement

BEEB EXPANSION

SOLIDISK FOURMEG 256K

The memory limit on the BBC micro can now be definitely a thing of the past. The new Solidisk Fourmeg board offers all you could wish for. It has 256K of extra RAM, a superfast 4MHz CMOS processor, sophisticated memory management sockets for high capacity ROMs and 32K of software in ROM. It is compatible with most hardware add-ons — except Sideways ROM expansion — which it replaces.

Fitting is easy. You remove the existing processor from its socket and plug the new board in its place, push on three colour-coded wires, clip on two mini hooks and its ready. Switch on the computer and you will immediately see the difference.

The message "Solidisk 256K expansion (4MHz)" announces the new memory size and speed.

A switch at the back lets you select between the old (2MHz) and the new (4MHz) speed.

The BBC micro at 4MHz easily surpasses the new Master 128K on benchmarks.

For example, it runs the benchmark using Basic 4 in only half the time taken on the Master 128K.

If you have too many Roms to plug in at once, the Fourmeg 256 offers two ways out. Firstly, it includes additional high capacity (and fast) ROM sockets. Moreover, two four normal ROM images can be stored in one high capacity ROM chip (by "vertical paging") — so more can be made immediately available to your fingertips.

Secondly, ROM images can be stored on disks and loaded into any one of the eight Sideways Ram banks available. If you need more room in "languages" such as VIEW or BASIC, you may use any of the eight SHADOW RAM banks. No user memory is then lost to the screen, whatever the screen mode.

You can turn the extra memory into a RAMDISC or a printer buffer by simple star commands. A Silicon disk of 200K, compatible with both the Solidisk DFS and ADFS formats replaces then one of the 4 physical disc drives. The Ramdisk is at least 10 times faster than physical disk drives and has no moving parts. The printer buffer saves you time, it lets you use the computer while feeding your printer in the background.

It is the most logical next step for owners of any Sideways ROM board or Solidisk Sideways Ram, who can trade in their present boards for the excellent Fourmeg 256.

To complement such a powerful product, Solidisk recommend Computer Concepts Wordwise Plus and Interword.

BEEB 256 PRICES:

TWO MEG 256, 16K MANAGER ROM	£115.00
TWO MEG 256, WITH WORDWISE +	£145.00
TWO MEG 256, WITH INTERWORD	£165.00
FOURMEG 256, WITH WORDWISE+	£165.00
FOURMEG 256, WITH INTERWORD	£185.00
ROM board TRADE IN discount	£30.00
Post and packing	£2.00

Shadow Sideways ROM and Sideways RAM All in One for £50:

This board, the TWOMEG 32K, is specifically designed with the school BEEB in mind so that one can have everything required on a single, compact and extremely easy to install unit. All the necessary software is in a MANAGER ROM (supplied).

The top row of five ROM sockets will take software ROMs, up to 32K each, such as used on the BBC Plus and the MASTER 128K.

The middle row contains 32K of additional CMOS, low power RAM, acting as Shadow Ram or as two banks of Sideways Ram.

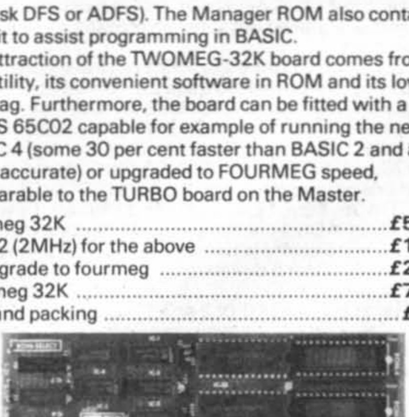
The empty 40 pin socket will receive either the normal 2MHz CPU or the optional enhanced, faster 4MHz CMOS 6502 (the board will then be called the FOURMEG 32K).

The TWOMEG 32K combines the usual functions of a Sideways ROM board — offering storage for up to 160K on board and 64K on the BEEB itself (a total of 224K out of 256K possible) and a SHADOW RAM compatible with major language ROMs such as BASIC, VIEW, WORDWISE, INTERWORD, VIEWSHEET, VIEWSTORE etc.

When Shadow Ram is in use, a small 8K of Sideways RAM is available for loading ROM images or a small printer buffer. When SHADOW RAM is not in use, the entire 32K additional RAM can be used as two banks of SIDEWAYS RAM or as a RAMDISC (available only with Solidisk DFS or ADFS). The Manager ROM also contains a Toolkit to assist programming in BASIC.

The attraction of the TWOMEG-32K board comes from its versatility, its convenient software in ROM and its low pricetag. Furthermore, the board can be fitted with a CMOS 65C02 capable for example of running the new BASIC 4 (some 30 per cent faster than BASIC 2 and also more accurate) or upgraded to FOURMEG speed, comparable to the TURBO board on the Master.

Twomeg 32K	£50.00
65C02 (2MHz) for the above	£10.00
Or upgrade to fourmeg	£25.00
Fourmeg 32K	£70.00
Post and packing	£2.00



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MASTER SERIES:

AMB15	Master 128	499.00
ADB12	Master ET	399.00
ADC06	Turbo Upgrade	125
ADC08	80126/512K	228.00
ADF13	Eprom cartridge	14.95

MANUALS AND DOCUMENTATION:

ADJ22	Ref manual Pt 1	14.95
ADJ23	Ref manual Pt 2	14.95

MASTER COMPACT SERIES:

ADB20	Master Compact Single drive	441.25
ADB20+ADF30	Master Compact S/D with TV mod.	457.35
ADB20+ADF31	Master Compact S/D with Mono monitor	537.85
ADB20+ADF32	Master Compact S/D with Colour monitor	687.35
ADF15	RS232 kit	29.90
ADF16	Second 3.5" floppy drive	113.85
ADF17	PAL TV Adaptor	29.90

ACORN SOFTWARE:

SUB27	Viewstore database ROM	59.80
SUB18	Pascal	69.00
	FORTH	19.90
	LISP	19.90
	MICRO-PROLOG	79.95

SOLIDISK SOFTWARE ROMS:

PCFS	Compatible with PC and MS DOS discs	15.00
PCMAN	MANUAL FOR PCFS	5.00
CDFS	single and double density DFS ROM for the COMPACT	10.00
MADFS	DFS and ADFS ROM (32k) for the Master	20.00
LMS	communication ROM for the Master	10.00
SOLIMON	Machine code monitor for Master/Compact	10.00
INSIGHT	Intelligent disassembler, XREF	20.00
UVP	Eprom programmer software (8k)	5.00

ECONET PRODUCTS:

ADF10	Econet plug-in	49.99
AEH17	100m Cable	99.00
AEH18	10station lead set	29.00
AEH19	Econet starter kit	99.00
AEH20	Econet bridge	199.00
AEH21	Econet socket kit	29.95
AES21	Level 2 Fileserver	249.00
AES22	Printer server ROM	49.00

DISC DRIVES:

FD35	3.5" 80-track double-sided single drive	£100.00
TWIN35	Twin DF35	£200.00
FD525	5.25" 80-track double-sided single drive	£115.00
TWIN525	Twin FD525	£230.00
20MB	Winchester new model, low cost SEAGATE	£700.00

PRINTERS:

LX86	EPSON LX86 + 2M printer lead	249.00
LXTF	LX80 Tractor Feed	31.30
LXCSF	LX80 Cut Sheet Feeder	53.53
FX85	EPSON FX85 NLQ + 2M printer lead	350.00
FXTF	FX85 Tractor Feed	30.59
FXCSF	FX85 Cut Sheet Feeder	123.50
NL10	STAR 80 col-120 cps par. 2M lead	289.00
NLCSF	Cut Sheet Feeder for NL-10	59.99
NLRIB	Black Ribbon for NL 10	5.64
MP165	Tractor and pich feed, 165 cps, NLQ, 2M printer lead, exceptional value	260.00
EPSRIB	Black ribbon for Epson and MP165	4.00
J6100	JUKI 6100 Daisy Wheel + 2M printer lead	340.00
JURIB	JUKI 6100 black vinyl printer ribbon	2.00
PAPER	2000 sheets cont. paper, A4 size 11" x 9.5"	14.00

MONITORS:

BM7502	12" Philips hi-res green screen, lead	85.00
BM7522	12" Philips hi-res amber screen, lead	86.00
CM8533	14" hi-res Colour Monitor, lead	299.00
TAXAN3	12" TAXAN Supervision 3, hi-res RGB Colour, lead	375.00
TAXAN2	12" TAXAN Supervision 2, Merdium-res RGB Colour monitor, lead	315.00
XC1404	14" Mitsubishi RGB colour monitor, lead	260.00

SOFTWARE PACKS:

SWPK1	5 software discs, 80 track. Database, spelling checker, machine code monitor, Macro Basic etc. 5.25" format	£10.00
	3.5" format	£15.00
SWPK2	5 software discs, 80 track. Games.	
	5.25" format	£10.00
	3.5" format	£15.00

DISKETTES:

MD525	5¼" low cost VEREX for all drives	.12.00
MD557	5¼" hi-rel MD557, Verbatim DSDD 96tpi	25.00
C102	3.5" low cost Verbatim for all drives	20.00
C103	3.5" hi-rel 90097M Vertbatim DSDD 135 tpi	28.00
C104	3" CF2/MSOFT for all Amstrad drives	39.00

CARTRIDGES:

ADF13	Acorn Eprom cartridge for two 27128	14.95
EPR32	Solidisk Eprom cartridge for one 27256	8.00
RAM32	Solidisk 32K RAM cartridge with battery backup and write protect switch	25.00
MEGA256	Solidisk 256K Mega-RAM card with RAM disc and printer buffer in ROM	100.00
MEGA256	Solidisk 1 Megabyte Mega-RAM card with RAM disc and printer buffer in ROM	POA
	Expected price in April/May	225.00

EXTRA DISCOUNT

If you buy a disc drive or a printer or a monitor at the same time you buy a Master or a Compact, you are qualified for SYSTEM DISCOUNT and a free Software Pack 1 (worth £10.00 or more).

Normal Package Price	System Discount	Reduction
£600-£699	3%	£18-£21
£700-£799	4%	£28-£32
£800-£899	5%	£40-£45
£900-£999	6%	£54-£60
£1000 and above	7%	£70-£££

Example of system		normal price	Discount	Net price
1	Compact Mono + MP165 printer	797.85	31.95	**765.94**
2	Compact Colour + Juki 6100	1027.35	71.89	**955.11**
3	Master 128 + twin F/Drives	729.00	29.16	**699.84**
4	Master 128, twin F/Drives, CM8533 Colour monitor	1028.00	71.96	**956.04**
5	example 4 + MP165 printer	1288.00	90.15	**1197-84**
6	Master 512 + twin F/Drives	957.00	57.42	**899.58**
7	Master 512 + twin F/Drives, plus 20 MB Winchester	1657.00	115.99	**1541.01**

SECONDHAND BEEB AND UPGRADE TO MASTER:

We buy and sell good condition second hand Beebs, even by post. Proof of original purchase is required if you are only selling your computer. Reduced commission is available if you are UPGRADING your BBC to a Master, ask for a MASTERPLAN quotation.

BBC Model	we buy at	we sell at
B-issue 2	131	175
B-issue 3	191	225
B-issue 4	187	250
B-issue 7	225	300

The prices above are given as average for very clean and good condition machines. Please ring for stock allocation before you call.

ORDERING BY POST:

All items can be ordered by post, sending the coupon below and enclosing cheques, POs, drafts or credit card numbers or by phone. P and P is charged as follows:

Less than 1 KG (eg software, cartridges and books): **£2.00**
Up to 3 KGs (eg single disc drives): **£3.00**
Up to 10 KGs (eg computer, monitors, printers, twin disc drives): you can specify either parcel post £6.00 or courrier/Datapost: **£12.00.**
Above 10KGs (eg complete system), please either allow generously or give us a ring for quotation.

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Please fill and send to:

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Southend-on-Sea, Essex SS2 6JQ

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Address: ....

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1-9 27128 250nS	2.57	2.95
10+ 27128 250nS	2.30	2.65
1-9 2764 250nS	2.26	2.60
10+2764 250nS	2.00	2.30
1-9 27256 250nS	4.57	5.25
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1-9 8271 controller	30.43	35.00
10+8271 controller	29.00	33.45
1-9 6264 LP 150nS	2.56	2.95
10+ 6264LP 150nS	2.30	2.65

ROMS/UPGRADES

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Inter-Word	37.39	43.00
Inter-Sheet	36.52	42.00
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Wordwise Plus	37.39	43.00
Spell Master	40.87	47.00
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AMX Max	16.09	18.50
Acorn 1770 DFS	42.61	49.00
Acorn 8271 DFS	41.74	48.00
B Plus 64K to 128K	26.00	29.90

SPECIAL OFFER

40/80T disc drive
from Akhter.
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Cumana CSX100	91.30	105.00
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Cumana CS100	117.39	135.00
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Philips BM7522	73.91	85.00
Acorn ADF 32	212.17	244.00
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Taxan KX1202 P39	91.30	105.00
Taxan KX1203	94.78	109.00
Taxan Sup. Vision 2	260.00	299.00
Microvitec 1451MS	223.48	257.00

(Prices inc. BBC Cable)

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View 3 User Guide	9.00	9.00
View Sheet User Guide	9.00	9.00
Master & B Dust Covers	3.00	3.45
Colour Compact	543.48	625.00
Printer Buffer software	4.30	4.95
Compact 5.25" upgrade	13.00	14.95

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Kaga/Taxan KP910	338.26	389.00
Juki 2200 D/W	225.22	259.00
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1. Remote keyboard case with 1.2m cable.
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4. Two blanking plates to blank out any drive apertures that are not used.
5. Full labelling kit.
6. Fully illustrated fitting instructions.

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DESCRIPTION	PRICE INC VAT
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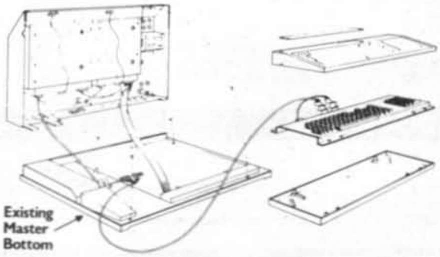
(c) Internal switched mode power supply	£32.00
(d) Fan kit	£25.00
(e) Viglen Master Cartridge System including two Viglen Cartridges	£14.95
(f) Viglen cartridge	£1.99
(g) Fitting (for 3½" drive)	£9.00
(h) Fitting charges start from	£15.00



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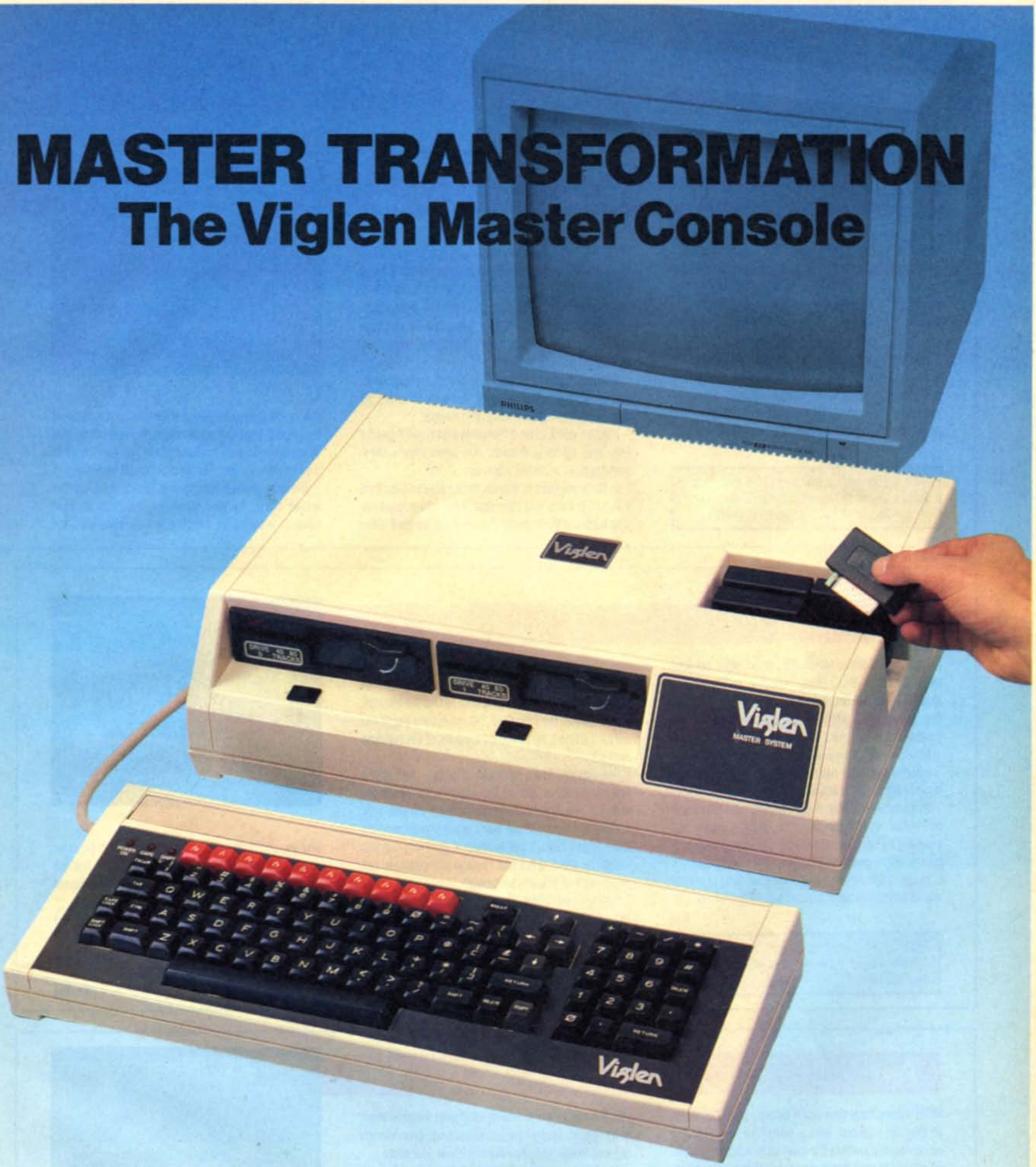
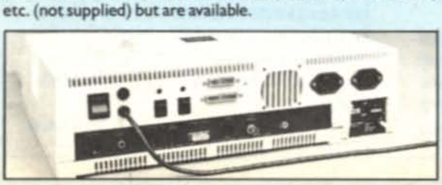
TRADE ENQUIRIES: Viglen Products Limited, 23/28 Penn Street, London N1. 01-729 2100.

MASTER TRANSFORMATION
The Viglen Master Console



Give your BBC Master Micro Computer the professional PC look by replacing your existing lid with this smartly styled package. The system is strong and constructed in high impact ABS colour-matched to the BBC Master, it gives your Master a very neat and impressive look.

The photograph shows a fully kitted out back panel with the host of accessories, such as switches, sockets, connectors, etc. (not supplied) but are available.



☐ Will support monitor – up to 16" television set.

☐ Can house two 5¼" disks or Winchester drives.

☐ Capable of housing 3½" drives.

☐ Includes two switches (can be used for 40/80 track switching) which can be fitted in the front or the rear. The above photograph shows two front fittings.

☐ Will take two Acorn cartridges or two Viglen cartridge system: each system is capable of accepting two Viglen cartridges, thus allowing a total of four Viglen cartridges to be used.

☐ Keyboard is separate for ease of use.

☐ Full internal metal screening.

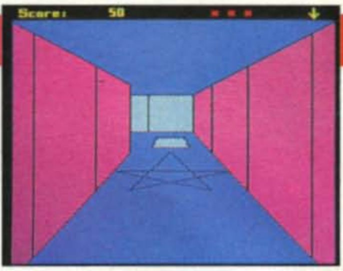
☐ Supplied with easy, do-it-yourself, fully illustrated instructions or can be fitted by Viglen.

☐ Available with fitted drives (5¼", 3½" or Winchester) or as a complete system including the master and monitor.

★★★★★ Excellent
★★★★ Worth buying
★★★ Only average
★★ Could do better
★ Give it a miss

The Acornsoft Hits Volumes 1 and 2

★ ★ ★ ★ ★



THOSE of you who have owned BBC Micros since the early days will no doubt look back with fond memories of such Acornsoft classics as Meteors, Arcadians and Planetoid. The new generation of BBC Micro and Master users can now share these memories with the release of The Acornsoft Hits volumes 1 and 2.

Volume 1 comprises Magic Mushrooms, Planetoid, Maze, and Rocket Raid. Magic Mushrooms is a ladders and levels game in which you play Murphy who's out collecting mushrooms. To complete this task you must negotiate escalators, conveyors, sheets of ice and dissolving floors. As if this weren't enough you're chased by marauding mutant tomatoes in a race against time. The game also includes an easy-to-use screen designer.

Planetoid is a faithful reproduction of that arcade classic, Defender. Flying your spaceship at low level over a planet's surface you blast aliens which are kidnapping your compatriots.

Working your way through the levels you encounter greater numbers and different varieties of alien, all becoming progressively faster and meaner.

If you're going to be a Planetoid expert you'll need a keen eye, lightning reflexes, and seven fingers which work together in perfect harmony.

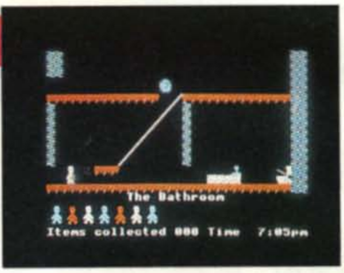
In Maze you have to recover three coloured tags from a huge 3D maze and then drop them into a large box also hidden in the maze. At this point you are given a key that is your passport to the next level. Killer robots patrol the maze giving the game its edge. You may not be able to see them but their mechanical whirring gets louder as they home in on you. The tension can be incredible.

The final game in volume 1 is Rocket Raid, another arcade clone. Fly your spaceship deep into an alien cavern, avoiding or zapping enemy missiles, and

Price: £9.95 each (cassette) £11.95 each (disc). Supplier: Acornsoft/Superior Software, Regent House, Skinner Lane, Leeds LS7 1AX. Tel: 0532 459453

Jet Set Willy II

★ ★ ★ ★



IF you enjoyed Manic Miner and Jet Set Willy, get your teeth into Miner Willy's latest escapade, Jet Set Willy II. In order to control the little man, the new game follows the same left, right and jump method as its predecessors, but that's where the similarity ends.

As you wander around you'll find the odd familiar room – bathroom, master bedroom, security guard – but in general the house is entirely different.

Owners of Manic Miner will be familiar with the strains of "In the Hall of the Mountain King" keeping you company as you play. JSWII serenades you likewise: A built-in sound on/off facility soon proves a godsend.

In JSWI the layout was a sprawling house in which the way to move from room to room was fairly obvious. The map of version II is in four separate parts, and the methods of getting between them are nothing short of arcane. It took me quite a long time to find the teleport.

According to the inlay card, Return restarts the game. In fact it doesn't, but repeated pressing of Escape does the trick.

One feature I found extremely irritating – and after a while downright unfair – is that when you lose a life you restart in exactly the same position. When you lose a life in JSWI you restart at the point where you entered the room: Not so JSWII. It's all too easy to get a long way into the game, make one small mistake and suddenly lose all seven lives in quick succession.

In this respect JSWII is less playable on the BBC Micro than JSWI. Software Projects, the original publisher of the Miner Willy games, intended that all conversions should remain faithful to the Spectrum version, simple graphics and all.

If misguided loyalty to the Spectrum original is the only reason for this loss of playability, the programmer should be shot. These passing gripes aside, I find the game great fun. Addicts of the previous versions will probably jump at it.

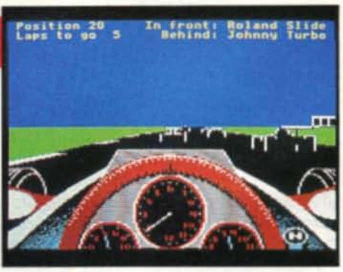
If you're after pretty graphics, Jet Set Willy II isn't for you. If you like platform games, with puzzles that can be solved only with split-second timing and pixel-precise positioning, grab it: You won't be disappointed.

Hac-Man

Price: £7.95 (cassette), £11.95 (disc) Supplier: Tynesoft, Addison Industrial Estate, Blaydon, Tyne and Wear NE21 4TE. Tel: 091-414 4611

Revs

★ ★ ★ ★



MOST micros have their motor racing games but that's all they are – games. Revs is one of the few programs which actually justifies the label of simulation. It must be one of the best motor racing programs on any micro.

This re-release follows the Acornsoft/Superior Software alliance. The new package includes the original program plus Revs 4 Tracks which used to sell separately with its own price tag of nearly £12.

Revs squeezes you into the cockpit of a Ralt RT3 Toyota Novamotor. It may only produce 160bhp but try putting your foot down when in a lower gear and you'll soon be fighting to keep her in a straight line.

The screen display shows the cockpit instruments, steering wheel, wing mirrors, and the circuit in front of you. The realism of the outside world gives the game much of its appeal. Each of the five circuits has been lovingly reduced in size and shoe-horned inside your micro.

The bends and straights are all there, even the rise and fall of the circuit is simulated. This is so good that you can feel yourself going up and down with the car.

A practice option allows you to discover the ins and outs of each circuit before trying it for real. Select the race option and you'll be asked for the class of race you wish to compete in, ranging from novice to professional.

You can then spend between five and twenty minutes trying to achieve a good lap time to determine your position on the starting grid.

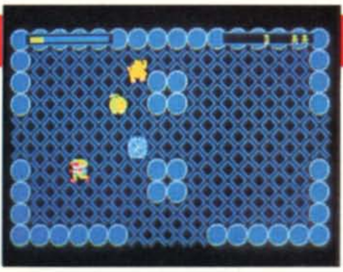
As with the real thing, you can adjust the settings of the front and rear wings. A high setting will help keep you on the track but will also reduce the car's top speed.

The circuit's realism is repeated in the car's handling. You'll spend your first few hours just trying to complete a circuit. One tip is to take the corners in one of the higher gears – you've five to choose from. When driving in a low gear the acceleration is so fierce that the car will spin at the slightest turn of the steering wheel.

Revs is an acknowledged classic. If you didn't buy it the first time round then get it now – it's even better value.

James Riddell

Price: £9.95 (cassette) £14.95 (disc) Supplier: Acornsoft/Superior Software, Regent House, Skinner Lane, Leeds LS7 1AX. Tel: 0532 459453



attacking enemy fuel and ammunition dumps to replenish your stocks.

The cavern is divided into distinct sections, each containing a new and different challenge.

The steady flow of high quality software is maintained as we boot up volume 2, which contains Starship Command, Arcadians, Meteors, and Labyrinth.

Starship Command uses classy high resolution line drawings to depict both your own and the alien spacecraft. Boldly going where no man has gone before you face an endless stream of alien ships just asking to be annihilated.

When things get too hectic you do what any self-respecting starship captain would do – bail out. If Starfleet consider that you scored sufficient points you'll be given another command on a new style starship.

No collection could be complete without my wife's arcade favourite, Arcadians, an excellent version of the arcade game Galaxians. In this the follow-up to Space Invaders the alien hordes take to the wing and dive bomb your laser base.

Arcadians is fast, furious, colourful, and ready with big bonus points for the pilot who stands fast and shoots the mothership and her two escorts as they come in for the kill.

Meteors, based on Asteroids down to the last detail, proves that the simplest ideas are often the best. Why should blasting rocks prove to be so addictive? Maybe it's the way that they float effortlessly through space, or the panic that grips you as you find yourself spinning frantically amid a barrage of speeding boulders.

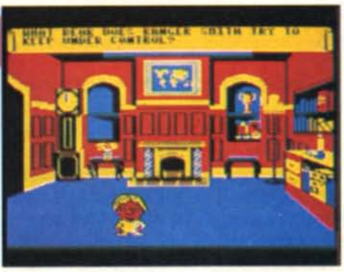
In Labyrinth, the fourth and final game of volume 2, you search for magic crystals in a complex maze of adjoining rooms. During your quest you will encounter mouth-watering fruit to replenish your energy level, and numerous technicolour monsters that must be crushed with your boulder. Top class.

These are the classiest compilations I have seen for the BBC Micro. There is not a single bad program in either volume. They're real collectors' items.

Jon Revis

Trivial Pursuit – Young Player's Edition

★ ★ ★



THE computerised version of the best-selling board game Trivial Pursuit has been very successful, judging by its high position in the Gallup charts.

Supplied with that game are 3000 questions taken mainly from the Genus Edition. Now you can buy the Young Player's Edition, either as a complete game, or as a Question Pack if you already have Trivial Pursuits.

This release makes it much more of a family game. Questions are stored in eight files on a separate cassette, four containing questions for 7 to 12 year olds, the rest for 12 years upwards.

The tape holds a total of 3000 questions on People and Places, Good Times, Science and Technology, Art and Culture, Natural World, and Games and Hobbies.

You will be faced with such questions as, "Does an elephant drink with its mouth or its trunk?", and "Who was the hero of Raiders of the Lost Ark?". None of the questions are held in memory, a new one being loaded from the cassette every move. This takes three to five seconds and can become a little tedious.

I won't go into too much detail of the game as this was covered in the December 1986 issue of *The Micro User*. Suffice to say that the game contains a not-too-impressive representation of the Trivial Pursuit board.

Questions can be of three types: A straightforward written question as in the board game, a picture question for which a projection screen is lowered to display an image, or a musical question.

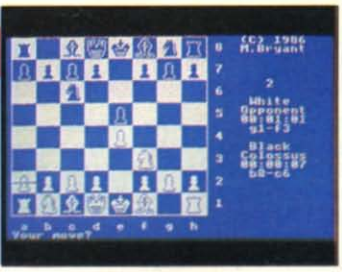
The package contains an interesting set of questions. The graphics aren't amazing but unless you've seen the excellent Amstrad or Commodore versions you probably won't be too disappointed.

Steve Brook

Price: £14.95 (cassette) £19.95 (disc) £7.95 (questions cassette)
Supplier: Domark, 204 Worple Road, London SW20 8PN. Tel: 01-947 6524

Colossus 4 Chess

★ ★ ★ ★



ACCORDING to CDS Software, Colossus 4 Chess is "the best chess playing program for home computers". Having spent all night locked in mental combat with it I am inclined to agree.

The disc version checks which BBC Micro you are using. Anything other than a standard model B results in a 64k program being loaded.

This version allows you to play back any of the 34 chess games stored as data files. The majority were played between a micro, mini, or mainframe computer, and a human opponent. This review, however, is based on the 32k version.

To give you some idea of the program's playing strength, the instruction booklet contains a list of results obtained when Colossus took on the best of the rest. Of the 21 programs challenged only six managed to avoid a 16-0 whitewash. The best of the contenders won only five games.

The game is played on a 2D, Mode 4 board which occupies two thirds of the screen. The rest of the display is devoted to the clocks and algebraic notation of the previous move.

You move pieces using the cursor keys or by entering algebraic notation. The 64k version allows a joystick to be used.

The program recognises a drawn game by three-fold repetition of position, the 50 move rule, or if neither side has adequate pieces to mate the other. It also acknowledges checkmate, stalemate, and time-up – the latter only used in certain playing modes.

Colossus offers a choice of six playing modes, most differing only in the way that the time clock is used. In Equality mode the time taken for the computer to make a move will echo that of your own.

The last two modes are concerned with problem solving. Infinite mode is intended to be used with "find the best move in this position" problems and will run for days if necessary. The second type is designed to tackle chess mating problems and will solve normal mates, self mates, and help mates, for up to seven moves ahead.

Colossus will allow you to step back through the game and try a different line of attack, or even play itself – the list of features is too long to mention.

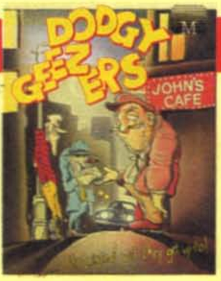
If you have ever wished for an all-singing, all-dancing chess program that could play a decent game, look no further.

Steve Brook

Price: £9.95 (cassette) £14.95 (disc). Supplier: CDS Software, Silver House, Silver Street, Doncaster DN1 1HL. Tel: 0302 21134

★★★★★	Excellent
★★★★	Worth buying
★★★	Only average
★★	Could do better
★	Give it a miss

Dodgy Geezers ★ ★ ★



THE team that produced Hampstead and Terrormolinos has been at it again. This time it's a B movie spoof – betrayed criminal seeks revenge, and all that stuff.

You play a character just released from jail who has to come to terms with his surroundings. Your task is to learn the lie of the land, assemble a team of criminals and, I think, do a blag job on a bank.

I put it like that because I haven't yet solved the first part of this two-part adventure, but what I have seen makes me recommend it.

The cassette inlay gives good, clear directions, and quickly creates an atmosphere that is continued in the game.

There are around 50 locations to explore in part one, and a lot of searching and examining to do. Dodgy Geezers is one of those games where objects are revealed as you search your surroundings.

To date I've had my hands torn to shreds, been mugged for being too nosey, and had my feet encased in concrete-filled wellies.

A move counter works in the game in two ways. Firstly, every so often a message appears telling you what time of what day it is (you start on a Friday).

Certain locations are not accessible all the time – banks, cafes, pubs, night-clubs and shops have different opening and closing hours.

Secondly, when you get killed you are told how many moves you have taken before you are invited to have another go.

It seems clear that the move counter is a vital ingredient. You only see certain activities at specific times, and you have to time your arrival at some locations precisely in order to meet people and get particular information (such as telephone numbers).

I think this game will keep us all guessing for quite a long time and, provided the humour is up your street, your frustration will be relieved just a little by the chuckles evoked. **Mad Hatter**

Price: £8.85. Supplier: Melbourne House, 60 High Street, Hampton Wick, Kingston-upon-Thames, Surrey KT1 4DB. Tel: 01-943 3911

The Rising of Salandra, Wychwood, The Nine Dancers ★ ★ ★ ★

WYCHWO
RISING OF SALANDRA
THE PROPHECY
RETURN of the W
ELEC
ELEC
ELECTRON
THE NINE DANCERS

I HAVE now seen the first Quilled adventures that I can recommend for the BBC Micro. They started off as Electron games, but are too good to be confined to that restricted market.

Three games have come to my attention. They are all top of Division Two in quality, and readers ought to add them to their collection. The author is Geoff Larsen, a long-standing contributor to Electron User.

Don't expect long textual descriptions as in Level 9 games – memory limitation prevents that. Even so, there are superb atmospheric descriptions of some locations.

There is great attention to detail, first rate puzzles, and all that a decent software house should offer.

I like the atmosphere, the descriptions, the puzzles (I haven't yet solved them all), the user-friendliness and the back-up help available. I consider that they fill a much needed gap in any adventurer's repertoire.

The Rising of Salandra is a two-part adventure of the traditional sort where you are required to defeat the forces of the Dark Lord.

Wychwood is an entertaining romp involving a newly-released prisoner (you) trying to lay hands on some hidden loot.

The Nine Dancers is less easy to describe – fantasy and reality have been cleverly woven together.

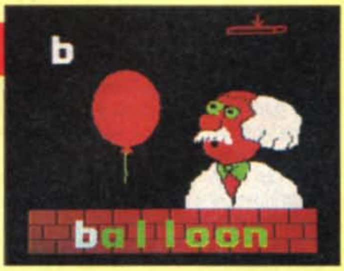
You will have to make frequent use of the verbs SEARCH and EXAMINE in order to make progress, because this is how many of the objects in the game are discovered.

A simple verb/object input is not always necessary, thanks to an ingenious approach taken by Geoff Larsen to the Quill parser. You can, for instance, enter CLIMB ONTO THE CHAIR in Wychwood, which to my mind is so much nicer than GO CHAIR.

Some lovely chaining puzzles are to be found. I can honestly say that I liked the games better than the Scott Adams ones I have seen so far. **Mad Hatter**

Price: £4.95, £3.95, £3.95 respectively. Add 30p for postage. Supplier: Larsoft, 4 Chantry Road, Clifton, Bristol BS8 2QD.

The Giddy Game Show ★ ★ ★



THE Giddy Game Show is a suite of early learning programs based around the characters used in Yorkshire Television's popular series. The principal aim is to get children to recognise the shapes of letters and the sounds they represent.

Program I is an alphabet book with 26 pages, one for each letter. An object is displayed and its name is written in large and well-formed text with the initial letter picked out in a different colour.

It looks very impressive but does nothing that a book can't. You turn the pages one at a time by pressing the spacebar and there is no option to go backwards.

Game II is a jigsaw puzzle in which the child must assemble letters of the alphabet. Again the visual quality is good and children are led sensibly through a sequence of operations.

The reward for success is a screen full of Giddies. It's a pity the programmers didn't take off the keyboard repeat, which makes it hard for heavy-handed youngsters to control the moving cursor.

Game III requires children to fly Giddy on his magic wand towards food that Gorilla wants. The name of the food is clearly shown and various pictures of it appear with appropriate initial letters.

If the child gives the right answer Gorilla eats the word while the picture vanishes down Giddy's wand. Selecting a wrong food causes Gorilla to growl and frown.

This program is great fun but because the cursor keys are used there is a real danger of pressing Break in error.

The final program is a maze game in which chidren can help to rescue the King who is imprisoned in a castle. They do this by guiding Princess Galaxzena around the maze past five objects.

The child has to hit the spacebar when the required option is highlighted. Inevitably, youngsters are going to get the wrong options as the highlight moves on.

The package is very attractive, and the minor niggles can easily be remedied by any Basic programmer. One other complaint is that the instructions are barely adequate, but overall I recommend the program. **Rog Frost**

Price: £9.95. Supplier: Mirrorsoft, Maxwell House, 74 Worship Street, London EC2A 2EW. Tel: 01-377 4600.

MEGA BYTES FOR MINI BUCKS

Viglen DRIVE 0
Viglen DRIVE 1

Picture shows 20 and 28 megabyte units. 40 and 56 megabyte units may be slightly taller in size

Plug in 20 to 112 MBytes of extra storage with the Viglen Winchester System

If you want to increase your storage capacity up to an incredible 112 MBytes you need a Winchester; but not just any Winchester ... the new Viglen System is 100% compatible, with the Acorn Winchester, it's simplicity itself to install and it costs a lot less than you think.

The Viglen Winchester is ready to plug straight into your BBC Master or if you have a B or B plus you will simply have to fit an ADFS ROM. You can use up to two floppy disk drives in conjunction with the unit and, fitted to the B+ or Master, the floppies can double their capacity by running in double density mode.

The 112 Viglen Winchester System is equivalent in capacity to over 1000 100K floppies or 250 400K floppy disks. It takes under 2.5 seconds to save 200K bytes, making it at least ten times faster than the equivalent floppy disc options. The system is designed for virtually every application from education or business to home use.

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VB120 20 M Drive 1 Winchester	599.00
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VB140 40M Drive 1 Winchester	819.95
VB156 56M Drive 1 Winchester	899.95
Acorn ADFS Rom with utilities (essential for BBC B and B Plus)	29.95
Acorn 1770 upgrade kit (BBC B)	49.95

WHAT DO I GET FOR MY MONEY

1. Winchester Unit – (winchester drive, controller boards, power supply and fan all fitted in one compact case). The fan is recommended in order to keep the winchester at the correct operating temperature.
2. Master Reference manual part 1 (for a BBC B or B plus you will require the Acorn ADFS Rom and utilities available at an extra cost).
3. Winchester user guide.
4. Additional utilities on the winchester including formatter, verifier, ADFS menu and backup programme.

PLUG IN SECOND DRIVE

The Acorn ADFS can handle up to two winchester drives. These are accessed as drive 0 and 1 (the floppy disc drives being accessed as drives 4 and 5). Viglen winchesters are supplied as Drive 0 (single unit) and Drive 1 (Second drive for single unit). The Viglen drive 1 can be instantly plugged into drive 0 and used either as a backup for Drive 0 (and perhaps taken off and stored away) or for more online mass storage. This will enable you to back up 20 Megabytes in under 7 minutes.

STORAGE OPTIONS:-

Drive 0	Drive 1	Total Capacity
20 Meg	20 or 40 Meg	40 or 60 Meg
28 Meg	28 or 56 Meg	56 or 84 Meg
40 Meg	20 or 40 Meg	60 or 80 Meg
56 Meg	28 or 56 Meg	84 or 112 Meg

COMPATABILITY!

Viglen winchesters are 100% compatible with the Acorn winchesters and the ADFS. Any program that will run on the Acorn winchester will also run on the Viglen winchester. The winchesters also run with the Acorn Master 512 board with DOS plus (CPM86 and MSDOS compatible operating system).

BACK OF UNIT

1 MHz IN: This socket is used to connect the micro to the winchester.
1 MHz OUT: This socket is used to connect any other device that is normally plugged into the 1 MHz bus on the micro.
DRIVE 1 DATA: This is a 20 way socket which is used to connect the data signals to a second winchester drive.
DRIVE 1 CONTROL: This is a 34 way socket which is used to connect the control signals to a second winchester drive.

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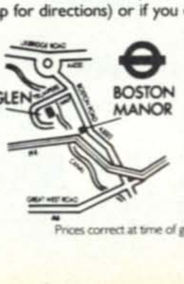
Simply write off today to Viglen and remember to add £8.00 carriage, packing and insurance, and allow 7 days for delivery. Credit card holders may order by telephone. If you'd like to find out more why not come down to our West London showroom (see map for directions) or if you can't make it simply ask for our special datasheet.

Viglen



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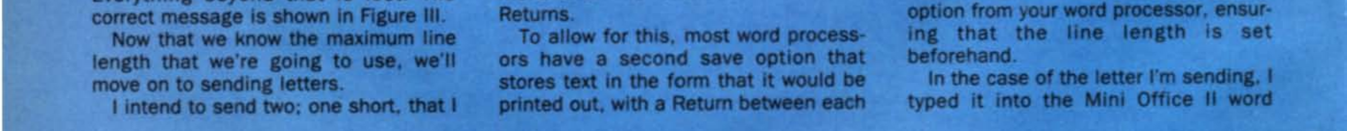
TRADE ENQUIRIES: Viglen Products Limited,
23/28 Penn Street, London N1. 01-729 2100.

Viglen Computer supplies: Unit 7, Trumpers Way,
Hanwell, London W7 2QA. Sales Hotline 01 843 9903.

Prices correct at time of going to press and subject to availability

START OF A NEW SERIES!

Communications



for beginners

ARE you confused by all the jargon used in communications? In these articles I intend to avoid technical terms as far as possible and explain how you can make the most of your modem.

After all, you tune into television programmes without understanding frequency modulation, PAL and other such terms, so let's treat communications in the same way: Use it, enjoy it and forget the technical terminology.

This month I'm going to look at electronic mail – Email as it's usually called. And I'll explain how you can send letters prepared on a word processor before you even touch a telephone, which helps to keep phone bills and other charges to a minimum.

I'll be using the Mini Office II package, as it contains both communications and word processing programs. And I'll be sending and receiving mail using MicroLink on Telecom Gold because of its user-friendly facilities.

I often receive Email where either the end of lines are truncated as in Figure I or they wrap around onto the next line as in Figure II.

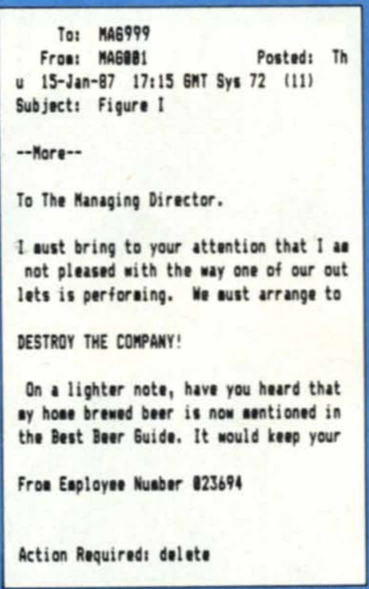
Sometimes there's even a combination of these faults, yet they're both easy to avoid.

The wrap round problem is caused by the sender's line length being longer than that on the receiving terminal.

So if you know that the person you are writing to has a terminal capable of handling an 80 chararacter width, keep your lines to 79 or less. If he has a 40 column display, or you are unsure of his system, keep to 39 character lines.

If you keep to these lengths, the truncation fault mentioned is automatically cured as well – it's caused by Telecom Gold only allowing line lengths of 120: Everything beyond that is lost. The correct message is shown in Figure III.

Now that we know the maximum line length that we're going to use, we'll move on to sending letters.



```
      To:  MAG999
    From:  MAG001                  Posted:  Th
u  15-Jan-87  17:15 GMT Sys 72  (11)
Subject:  Figure I

--More--

To The Managing Director.

I must bring to your attention that I am
 not pleased with the way one of our out
lets is performing.  We must arrange to

DESTROY THE COMPANY!

 On a lighter note, have you heard that
my home brewed beer is now mentioned in
the Best Beer Guide. It would keep your

From Employee Number 023694


Action Required: delete
```

Figure I: The results of line truncation

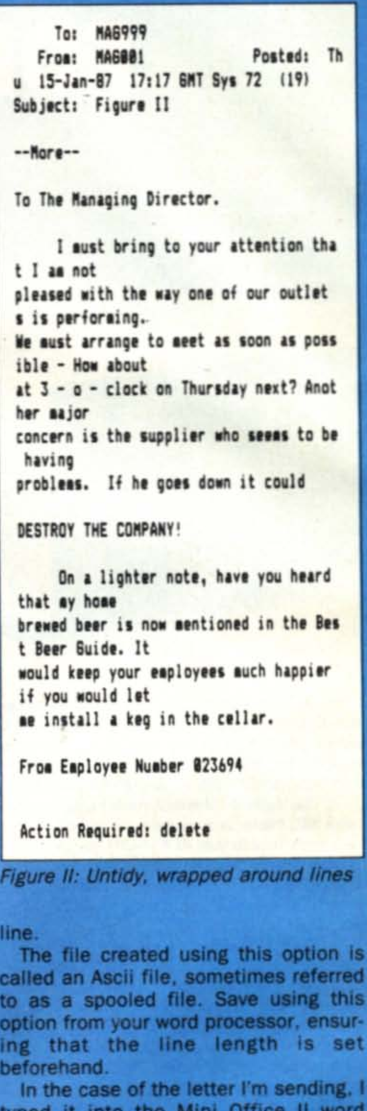
I intend to send two; one short, that I can quickly type while I'm online, and a longer one that I'll word process, check and ensure is correct before going online.

First let's look at the word processing part of the operation.

When you save text from most word processors, only the Returns you put in yourself – usually at the end of paragraphs – are saved.

As I have said, for most terminals you are usually restricted to a line length of 79 – in other words there must never be more than 79 characters between Returns.

To allow for this, most word processors have a second save option that stores text in the form that it would be printed out, with a Return between each line.



```
      To:  MAG999
    From:  MAG001                  Posted:  Th
u  15-Jan-87  17:17 GMT Sys 72  (19)
Subject:  Figure II

--More--

To The Managing Director.

      I must bring to your attention tha
t I am not
pleased with the way one of our outlet
s is performing.
We must arrange to meet as soon as poss
ible - How about
at 3 - o - clock on Thursday next? Anot
her major
concern is the supplier who seems to be
 having
problems.  If he goes down it could

DESTROY THE COMPANY!

      On a lighter note, have you heard
that my home
brewed beer is now mentioned in the Bes
t Beer Guide. It
would keep your employees much happier
if you would let
me install a keg in the cellar.

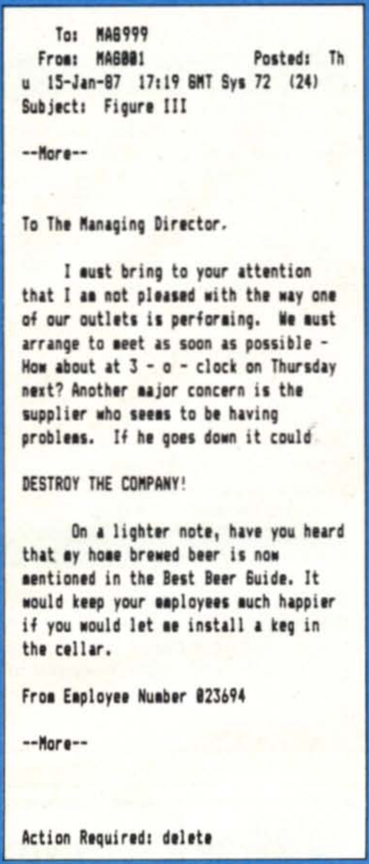
From Employee Number 023694


Action Required: delete
```

Figure II: Untidy, wrapped around lines

The file created using this option is called an Ascii file, sometimes referred to as a spooled file. Save using this option from your word processor, ensuring that the line length is set beforehand.

In the case of the letter I'm sending, I typed it into the Mini Office II word



```
     To:  MAG999
   From:  MAG001              Posted:  Th
u  15-Jan-87  17:19 GMT Sys 72  (24)
Subject:  Figure III

--More--


To The Managing Director.

       I must bring to your attention
that I am not pleased with the way one
of our outlets is performing.  We must
arrange to meet as soon as possible -
How about at 3 - o - clock on Thursday
next? Another major concern is the
supplier who seems to be having
problems.  If he goes down it could

DESTROY THE COMPANY!

       On a lighter note, have you heard
that my home brewed beer is now
mentioned in the Best Beer Guide. It
would keep your employees much happier
if you would let me install a keg in
the cellar.

From Employee Number 023694

--More--


Action Required: delete
```

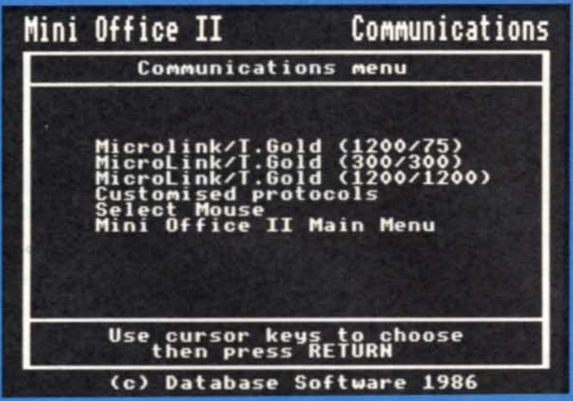
Figure III: How the message should look

processor with the usual menu settings and embedded commands, the only essential one being that the line length is 79.

The next stage is to save the file ready to send. Select the Save text option and you will be presented with the choice between Mini Office II file or Ascii file.

Select Ascii and your text will be saved just as it looked on the printout, with Returns at the end of lines. When you are prompted for the filename, enter the name LETTERS.

Now that the letter is prepared and ready to send, let's turn to the communication section of Mini Office II. As I said, I am going to use MicroLink, so I obviously have to select from one of the first three options on the menu in Figure IV.



```
Mini Office II          Communications
          Communications menu

     Microlink/T.Gold  (1200/75)
     MicroLink/T.Gold  (300/300)
     MicroLink/T.Gold  (1200/1200)
     Customised protocols
     Select Mouse
     Mini Office II Main Menu

       Use cursor keys to choose
          then press RETURN
     (c) Database Software 1986
```

Figure IV: The communications menu

The numbers are the possible baud rates. As I promised to avoid technical jargon let's just say that they represent the speed of data transfer with 1200 being four times as fast as 300, which is four times as fast as 75.

So, at 1200/1200 you send and receive quite quickly, 300/300 is relatively slow and 1200/75 receives quickly and sends very slowly.

Unfortunately, modems capable of using the 1200/1200 rate are more expensive. And as most people are stuck with one of the other two, which should you choose?

Most of the time you are online information will be coming to you and you will be typing responses. As the 75 rate is adequate to keep up with most people's typing, the best rate to choose is 1200/75.

However, if you are sending a lot of

Turn to Page 38 ▶

Peter Davidson helps you to make the most of your modem

◀ *From Page 37*

word processed information the 300/300 rate is better – you send data four times as fast and this outweighs the disadvantage of the quartering of the receive rate.

In the case of the two letters that I am going to send, one is to be typed in direct and, although the other is word processed, it is short so I will select 1200/75.

To communicate using Mini Office II press Return twice at the Communications Menu (other rates only require a cursor movement first). You will be presented with a blank screen and are ready to dial up the computer.

At this point your actions will vary according to whether you dial the computer directly or connect to it via PSS – another technical term that means that you phone a distant computer at the cost of a local call, plus a small surcharge.

What you should do now is well documented in many places, including the MicroLink handbook, so I will assume that you have followed the simple steps and are online with the prompt > indicating that the Telecom Gold computer is waiting for you to type something. So just type:

```
Mail send
```

and the computer will respond with the prompt:

```
To:
```

At this point type the ID number of the person you are sending mail to. I'm sending both my letters to Mag999 and for demonstration purposes using Mag001 to send them.

Next you will be prompted for the subject. When your letter reaches the recipient, this will be presented as he scans his mail. When he reads his mail he will first be shown the subject and given the opportunity not to read the rest of the message.

It is therefore important to ensure that the subject is relevant to the message so the recipient can choose whether to read or ignore it.

The next prompt you get is:

```
Text:
```

and you then just type in the text, pressing Return at convenient breaks between words, but not letting any line wrap around on to the next one. Once the short message is complete, type:

```
.send
```

and the message is sent.

Now for the word processed letter. Type "Mail send", as before, and follow the same steps up to the Text prompt.

Then press f1 (transmit file) and you will be asked if the file is Ascii or Expanded Ascii. Press 1 which confirms that you are sending an Ascii file and you will be asked for the filename.

The text was saved as the file LETTER, so after entering this you should then see your file on the screen as it is sent.

Don't worry about the File Transmitted message that will appear, seemingly before the transmission is complete. When the end of your text is on the screen, type ".send" on a new line as before and your letter will be sent.

All that remains is to type:

```
Bye
```

and hang up the phone.

● *Next month I'll be looking at more of the features of the Telecom Gold mail system, but until then I hope I've given you enough information to let you realise how quick and easy it is to send Email.*

REPLAY

The Acclaimed Utility for Tape to Disc Transfer

Vine Micros

"REPLAY is a pretty marvellous device, more than a toy for those who have to document software, very useful if you can only buy a tape version of a program (it doesn't matter what nooks and crannies the code is packed into) and a good opportunity to have fun with the screens of your choice. A liberating piece of software and highly recommended".
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"REPLAY is the current state-of-the-art answer to tape to disc transfer, available for the BBC B (and B+). This consists of a ROM and some hardware which must be attached inside the computer. Once installed it will cope with virtually any program you care to put to the test".
'First Byte', ACORN USER, May, '86.

"Many facilities are advertised to enable BBC micro users to copy or back-up protected programs and transfer them from tape to disc. While some break the protection in the process and thus assist software piracy, others are more responsible, using techniques which retain the protection. Vine Micros, who already leads the field in the latter group with the T.D.ROM, now supplies REPLAY".
'ROM Roundup', MICRO USER, July, '86.

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R1770B+ - BBC B+: R1770C - Opus Challenger: R1770W - Watford DDFS: R2791 Opus 3.15:
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MU/3

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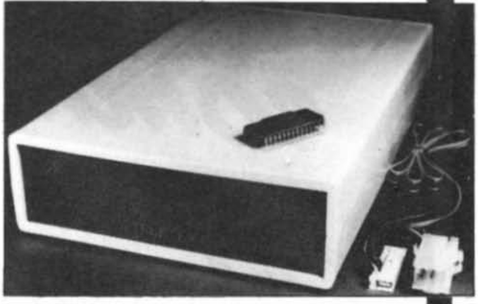

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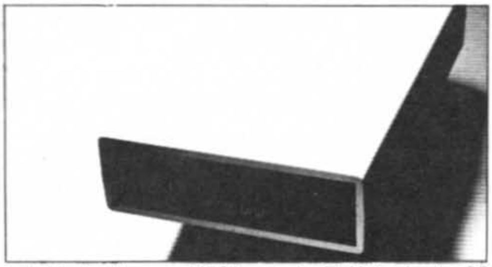

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Putting two dimensional arrays to work

BEGIN HERE
Part 15

LAST month saw us dealing with the class shown in Figure I and attempting to find some way of representing their names in a program. We saw that using an array to hold the children's names and indexing this array with the desk numbers worked quite well.

The trouble was that it didn't hold the information in any realistic fashion. An array element *desk$(7)* might contain the name Nahid, but it gives no information about where she sits. As we saw, a much better method is to locate a name by using the row number and column number of the desk to provide a sort of grid reference. Table I shows how this is done.

From this it's obvious that Nahid sits in the desk where row 3 and column 1 intersect. It's also easy to figure out who sits in front of her and to her left.

Using the row and column numbers like this is a much better way of holding information about the class. But, as we saw last time, we can't use our old arrays to do this. Their elements only held one number, or subscript, or index, in the brackets at the end of the root name.

Because of this single figure subscript, they're known as one dimensional arrays. What we need is an array element that can be referenced with two numbers. One number will be for the row, the other for the column.

Such an array, with two figures in the following brackets, exists. It's known as a two dimensional array and is ideal for handling information in tabular form. Program I, a version of last month's Program VI, shows one in action.

By now you should know what the first three lines are doing. I've used *row* and *column* to hold the dimensions of the classroom (three rows of three desks). Line 40 creates the two dimensional string array *name$()*. When the values are substituted in the place of the variables it becomes:

```
40 DIM name$(3,3)
```

Notice that there are now two figures inside the brackets. Both are used to pick out a particular element from the array.

Once the 2D array has been dimensioned, the program comes across the pair of nested loops formed by lines 50 to 90. As will be obvious from line 70, the point of the loops is to take the names from the program's three data lines and put them into the array. However it might not be too obvious how it's done, so let's have a look at these loops in detail.

The first time round the outer loop, *row* will have the value 1. This will remain the value of *row* while the inner loop cycles three times, with *column* going from 1 to 3.

This means that the initial time round the inner loop *row* is 1 and *column* is 1. Line 70 is effectively:

```
70 READ name$(1,1)
```

This takes the first item of data from the list starting at line 140 and so *name$(1,1)* holds Pete.

For the second cycle of the inner loop, *row* is still 1 but *column* becomes 2. Now line 70 equates to:

```
70 READ name$(1,2)
```

and so Noreen finds her way into *name$(1,2)*.

On the third and final pass through the inner loop *column* increases to 3 and so Colin is stored in *name$(1,3)*.

The program then drops out of the inner loop only to be caught by the NEXT of the outer loop and sent back for another lap with *row* now becoming 2. Once again the inner loop cycles three times reading data into *name$()* while *column* goes from 1 to 3 as before.

But this time *row* is 2 so the names John, Phil and Lorraine are read into *name$(2,1)*, *name$(2,2)* and *name$(2,3)* respectively. I leave it to you to figure out what happens the third time round the outer loop. Figure II shows the desks, who sits at each of them and the

Turn to Page 42 ▶

column / row	1	2	3
1	Pete	Noreen	Colin
2	John	Phil	Lorraine
3	Nahid	Carole	Mike

Table I: An alternative who sits where

```
   10 REM Program I
   20 row=3
   30 column=3
   40 DIM name$(row,column)
   50 FOR row=1 TO 3
   60 FOR column=1 TO 3
   70 READ name$(row,column)
   80 NEXT column
   90 NEXT row
  100 INPUT "Which row",row
  110 INPUT "Which column",column;
  120 PRINT name$(row,column);
  130 PRINT " sits at the desk on row ";
row", column ";column"."
  140 DATA Pete,Noreen,Colin
  150 DATA John,Phil,Lorraine
  160 DATA Nahid,Carole,Mike
```

Program I

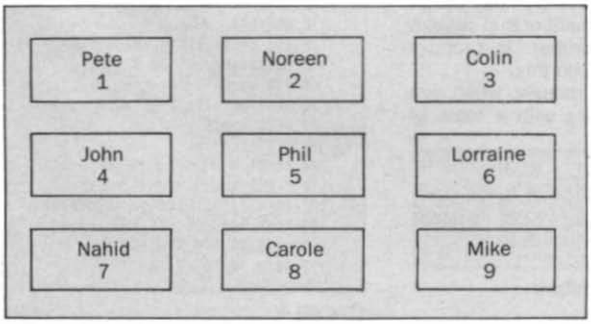


Figure I: Who sits where in the classroom

◀ *From Page 41*

subscript used to locate them in the array *name$()*.

Once we've got our information held in a two dimensional array, it becomes much easier to manipulate it. They're just made for nested FOR...NEXT loops. In the case of *name$(row,column)*, if you want to know all the people in a particular row you just set *row* to the required row number and vary the value of *column* using a FOR...NEXT loop.

Try modifying Program I so that it gives you all the members of a particular row or column.

Of course there is a drawback with two dimensional arrays. We have to use two subscripts instead of the more familiar one. This seems a small price to pay for the added flexibility.

Bear in mind though that wherever you use a two dimensional array you can get away with a one dimensional array. Which you choose depends upon circumstances.

And, if you want, you can look on your two dimensional arrays as a set of three one dimensional arrays as Table II shows.

Viewed in this way the first subscript inside the brackets can be seen as choosing between three arrays. With *row* as 1, then the array containing Pete, Noreen and Colin is chosen.

With *row* as 2, the one dimensional array with elements John, Phil and Lorraine is selected. In effect the first subscript acts as a switch between our trio of one dimensional arrays.

The second subscript then just refers to a particular element in the selected one dimensional array. Looking at things this way, *name$(3,2)* picks the third array and from this selects the second element, Carole.

Whichever way you look on two dimensional arrays, they're useful whenever you're dealing with information in tabular forms and so score over one dimensional arrays.

Harking back to one dimensional arrays, you might remember how we avoided the element with the zero subscript. With a one dimensional array, say, *example()* we wouldn't use *example(0)*. Admittedly this is wasteful, but it does help keep things simple. I much prefer an array about the days of the week to have elements numbered from 1 to 7 rather than 0 to 6! Readers with enquiring minds might wonder if this occurs with two dimensional arrays.

Row	Column ()		
	1	2	3
1	Pete	Noreen	Colin
2	John	Phil	Lorraine
3	Nahid	Carole	Mike

Table II: Desks as 3 parallel arrays

	Jan	Feb	Mar	Apr
Sales	100	200	300	300
Cost	90	190	240	230
Profit	10	10	60	70

Table III: Motorway Gnomes Ltd – sales figures

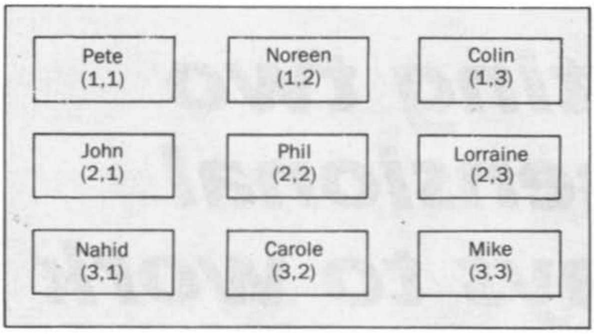


Figure II: Desks with array subscript

The answer is that it does and it's much worse, as Figure III shows. With a statement like:

```
DIM name$(3,3)
```

not only do we get the elements we've dealt with, we also get elements where one or both of the subscripts are zero. And these we've blithely ignored in Program I.

And I'm going to carry on ignoring them. If you want to use *name$(0,0)* or *name$(0,2)* it's up to you. I won't. This may be wasteful of space but I find this better than trying to imagine a row zero or column nought, but as an illustration of their existence, Program II shows these zero elements in use.

And talking of rows and columns, our ever inquiring reader may have noticed that we've always dealt with our tables in the order row, then column. In other words, the first subscript of the array selected the information held in a row of the table while the second indicated one element of that row, using its column number as a reference.

We're not stuck with this, we could just as easily have arranged it so that the first subscript refers to a column and the second to an element of that column selected by row number. In fact try altering Program I to do this.

Having said that though, when you pick a way of dealing with a table of information, stick to it. It's all too easy to get your rows and columns in a twist. The standard method is to use rows then columns. I'll be sticking to that.

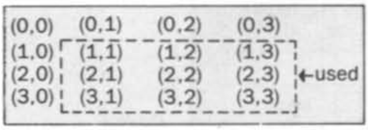


Figure III: Elements available and elements used

```
   10 REM PROGRAM II
   20 DIM number(3,3)
   30 FOR outer=0 TO 3
   40 FOR inner=0 TO 3
   50 number(outer,inner)=outer*inner
   60 PRINT "(";outer;",";inner;")", num
ber(outer,inner)
   70 NEXT inner
   80 NEXT outer
```

Program II

If you write a program which gives you the right results but in the wrong pattern, have a look at the way you're dealing with your two dimensional arrays.

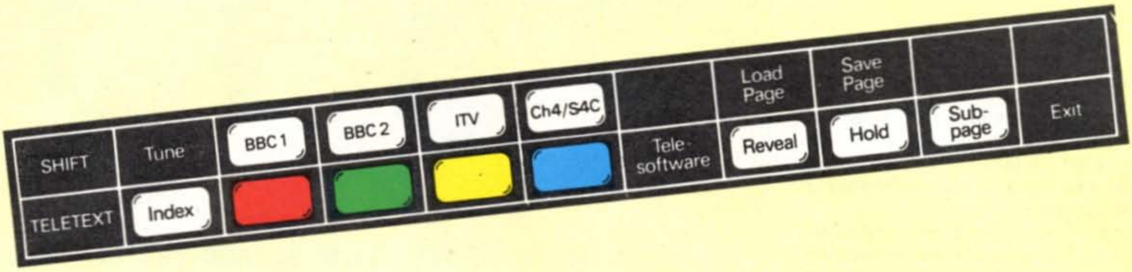
Finally have a look at Program III which deals with the information held in Table III. Notice that I'm using the row/column method of addressing elements of the array. Apart from the fact that it's a numeric array, can you spot anything else about *details()*?

Whereas our previous two dimensional array had three rows and three columns – a 3x3 array – *details()* has three rows and four columns. It's a 3x4 array. Armed with the knowledge that you're not stuck to 3x3 arrays, have a go at dimensioning your own two dimensional arrays.

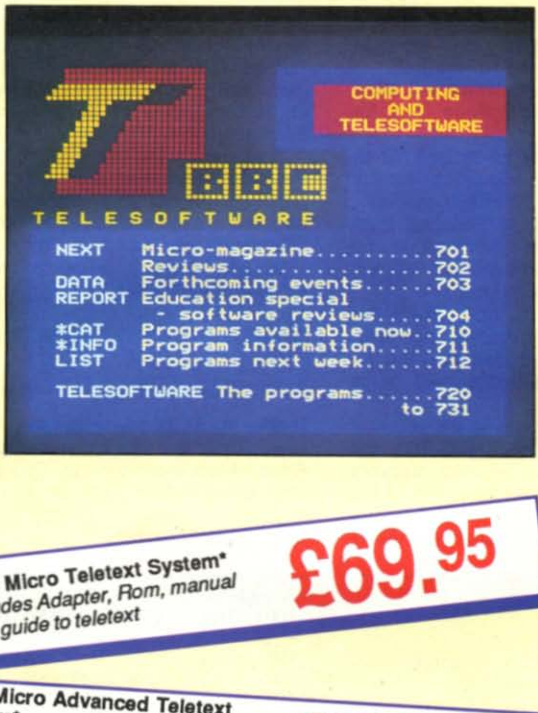
● *That should keep you busy until next month, when we'll be looking at some basic Basic decisions.*

```
 10 REM Program III
 20 figures=3
 30 month=4
 40 DIM details(figures,month)
 50 FOR figures=1 TO 3
 60 FOR month=1 TO 4
 70 READ details(figures,month)
 80 NEXT month
 90 NEXT figures
100 INPUT "Which figure",figures
110 INPUT "Which month",month
120 PRINT details(figures,month)
130 DATA 100,200,300,300
140 DATA 90,190,240,230
150 DATA 10,10,60,70
```

Program III



Turn your BBC Micro into a teletext receiver!



```
COMPUTING
AND
TELESOFTWARE

TELESOFTWARE

NEXT    Micro-magazine..........701
        Reviews.................702
DATA    Forthcoming events......703
REPORT  Education special
         - software reviews.....704
*CAT    Programs available now..710
*INFO   Program information.....711
LIST    Programs next week......712

TELESOFTWARE The programs......720
                             to 731
```

Throughout Britain, 3½ million households regularly watch teletext – the many thousands of pages put out by Ceefax and Oracle covering everything from share prices to football results.

But if you have a BBC Micro you can do much more than just flash from page to page. With the BBC Teletext Adapter and rom – and using a normal TV set or monitor – you can store the pages in memory, transfer them to tape or disc, and display them again and again in any order you like.

BBC Micro Teletext System*
Includes Adapter, Rom, manual and guide to teletext
£69.95

BBC Micro Advanced Teletext System*
Includes Adapter, Advanced Teletext Rom, manual and guide to teletext
£74.95

**Not compatible with the BBC Compact*

BBC Advanced Teletext Rom
For existing users who wish to upgrade to the new Rom software
£7.95

All prices include VAT & P&P

For an extra £5 we will send you the BBC Advanced Teletext software – the only package providing ALL the features offered by the BBC/ITV services. Its many enhancements include automatic loading of associated pages each time you select a page from the menu – considerably speeding up access time.

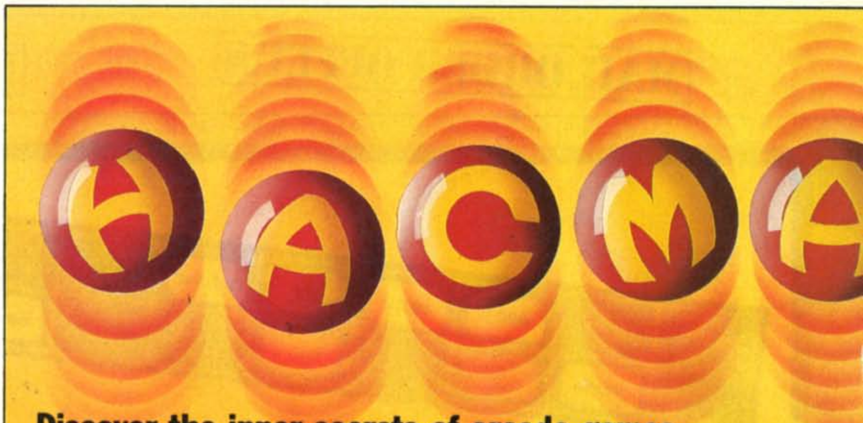
There may be some pages you wish to look at regularly, such as news, sports results or weather. The latest teletext rom can be programmed to "keep" such pages for you, updating them as necessary. They can be displayed at the touch of a key, without waiting for them to come round.

- *If you already have the BBC Teletext System we will send you the new rom for £7.95.*

IMPORTANT: *The BBC point out that the Teletext Adapter, like a TV set, will not work satisfactorily without a good outside aerial. Nor will it funtion correctly if you experience interference such as ghosting.*
They emphasise that these problems only affect a few areas of the country. However, if you have any doubts as to the quality of signal available in your area you should contact the BBC Technical Support Service on 01-927 5040.

TO ORDER TURN TO THE FORM ON PAGE 159

START OF A NEW SERIES



Discover the inner secrets of arcade games

ANYONE who keeps even half an eye on what goes on in the games world will have heard of Miner Willy, who first reared his head in the enormously successful game Manic Miner.

Using simple controls – left, right and jump – you have to progress through 20 levels collecting keys located in the most inaccessible places while avoiding such bizarre obstacles as telephones, Pac-men and flapping toilets.

The follow-up, Jet Set Willy, is possibly the biggest selling arcade game of all time. It has almost certainly been hacked about more than any other.

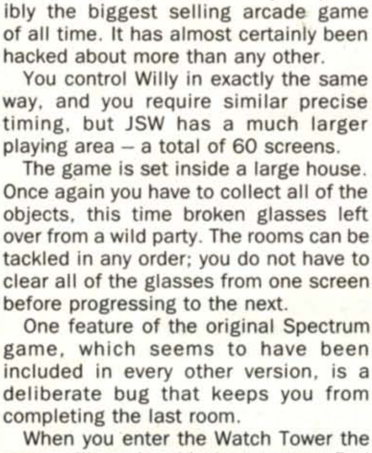
You control Willy in exactly the same way, and you require similar precise timing, but JSW has a much larger playing area – a total of 60 screens.

The game is set inside a large house. Once again you have to collect all of the objects, this time broken glasses left over from a wild party. The rooms can be tackled in any order; you do not have to clear all of the glasses from one screen before progressing to the next.

One feature of the original Spectrum game, which seems to have been included in every other version, is a deliberate bug that keeps you from completing the last room.

When you enter the Watch Tower the game will crash, with the message Bad Program. Does anyone know a poke for the BBC Micro version to fix this?

Both Manic Miner and Jet Set Willy are available for the BBC Micro, courtesy of Tynesoft. Miner is also one of the titles on the Computer Hits 10 Volume 3 compilation.



By now many of you will have seen the latest challenge, Jet Set Willy II. This is an enhanced version of JSW, on tape only, and follows the same basic idea.

It is an extremely good game in its own right, and certainly well worth looking at if you enjoyed the other two.

You start in the bathroom as before, but thereafter, with few exceptions, the house is entirely different. A word of warning – this time the toilet kills!

Listing I is a routine which will allow invulnerability and/or infinite lives for the new game.

Type it in exactly as shown. Then insert a blank tape and press Record/Play. Type *SPOOL JSW2HACK and LIST.

When the listing is finished type *SPOOL. This will save the program in a form in which it can be merged with the original program, as follows.

Type PAGE=&1400 and CHAIN the original JSW II tape from the beginning. When LOADER has loaded, and the Jet Set Willy II message is displayed, press Escape.

Put the upgrade tape in the recorder and type *EXEC JSW2HACK. This will load the new routine into memory exactly as if you had typed it in at the keyboard.

Disregard the two Mistake error messages at the start and end – they are not important.

When the JSW2HACK file has finished loading put the original tape back into the recorder and type RUN. You will then be asked if you want infinite lives or invulnerability: Just hit Y or N.

Press Play on the recorder and the game proper will load and run. The loading screen display will be corrupted, but this does not matter.

These extra facilities, together with the map and list of room names also provided, should give everyone – not only the arcade wizards – a chance of completing this superb game.

But who can do it in the fastest time *without* these cheats?

Over to you . . .

Thanks to all of you who have written in with hints and tips for various games. Please keep them coming. One point I must stress is that if you send in pokes and similar routines, please give full descriptions of how they are to be

```
  50 MODE1:PROCupgrade
 187 CALL&900:END
1000 DEF PROCupgrade
1010 REM Jet Set Willy II Upgrade
1020 REM by Hac-Man 1987
1030 REM (c) The Micro User
1040 FORI%=0TO2STEP2:P%=&900:[OPTI%
1050 LDX#cli1 MOD256:LDY#cli1 DIV256:JS
R&FFF7
1060 LDX#cli2 MOD256:LDY#cli2 DIV256:JS
R&FFF7
1070 LDA&73:BEQ infinite:LDA#&EA:STA&18
17:STA&1818:STA&1A6B:STA&1A6C:STA&1A8A:
STA&1A8B:STA&5527:STA&5528:\invulnerabi
lity
1080 .infinite LDA&70:BEQ lives:LDA#&EA
:STA&169C:STA&169D:\ infinite lives
1090 .lives LDA&71:STA&5570:\ no. of li
ves (&9B)
1100 LDA#18:STA&557E:\ starting room (&
55)
1110 LDA#7:STA&556B:\ 7 o'clock start (
&556B)
1120 LDA#&BF:STA&157A:STA&527A:\ Caps L
ock - left
1130 LDA#&FE:STA&1583:STA&5283:\ Contro
l - right
1140 LDA#&B6:STA&158F:STA&528F:\ Return
 - jump
1150 JMP&4D07
1160 .cli1 EQUS "LOAD WHOP1"+CHR$(13)+C
HR$(0)
1170 .cli2 EQUS "LOAD WHOP2"+CHR$(13)+C
HR$(0)
1180 ]:NEXT
1190 PRINT'"Do you want infinite lives(
Y/N)? ";
1200 G%=GET:?&70=0:IFG%<>89THENPRINT"No
"ELSEPRINT"Yes":?&70=1:A$="7":GOTO1230:
REM infinite lives
1210 PRINT'"Please type the no. of live
s(1-16): ";
1220 INPUT'"A$:IFA$=CHR$(13)ORVAL(A$)<1
ORVAL(A$)>16THENA$="7":PRINTTAB(36,3);A
$
1230 ?&71=VAL(A$):REM no. of lives (&9B)
1240 PRINT'"Do you want invulnerability
(Y/N)? ";
1250 G%=GET:?&73=0:IFG%<>89THENPRINT"No
"ELSEPRINT"Yes":?&73=1:REM invulnerable
1260 A%=INKEY(1000)
1270 ENDPROC
```

Listing I: Jet Set Willy cheat program

entered. They should be designed to work with the commercially available program exactly as it would be bought off the shelf – not, as in some cases, with a modified version of the game.

One game which keeps cropping up time and again is Superior's Thrust. Stephen (sorry – can't read your surname) of Belfast writes in with an interesting tip.

On the Reverse Gravity level "if you turn your TV or monitor upside down it becomes much easier to play". I wonder why I didn't think of that?

Martin and Matt of Cardiff have sent in a short routine to obtain infinite lives and fuel on Thrust. It goes as follows:

```
*LOAD THRUST3
?&56EB=0
CALL&5720
```

Wait for five seconds and press Break:

```
?&5685=0:?&56C7=&60
CALL&5633
?&1971=0:?&1981=0
```

For infinite lives, and:

```
?&1A54=0:?&1A56=0
```

For infinite fuel; finally type:

```
CALL&3C80
```

Don't forget to press Return after each line. The routine works very well, but I still can't get the hang of the game.

M.R. Herdman has sent in four pages of hints on how to play Thrust. Unfortunately we don't have the space to print them, but the sheer effort was much appreciated. He (she?) would also like to know if anyone has found Dr Torpedo in Spy Hunter. Can anyone help?

Twelve-year-old Ian Colvin seems to have the ancient art of Yie Ar Kung-Fu sewn up. He has written in with all the tactics needed to become the Grand Master.

Your first opponent, Buchu, can be flattened with a combination of roundhouse kicks and lunge punches. Star can be defeated using lunge punches, whereas ankle punches are needed for the Nuncha.

Pole is easy – just kick him in the head. Feedle is difficult; you have to dodge or hit many objects at once. Practice makes perfect . . .

A change of background brings on a further array of suspicious characters, all with the same evil intent.

Chain can be taken out with ankle punches while both Fan and Sword are most vulnerable to roundhouse kicks.

Here's where it gets confusing – you must fight a carbon copy of yourself. It can get difficult to remember which is which.

After another round of Feedle throwing things at you, you are entitled to call yourself a Grand Master.

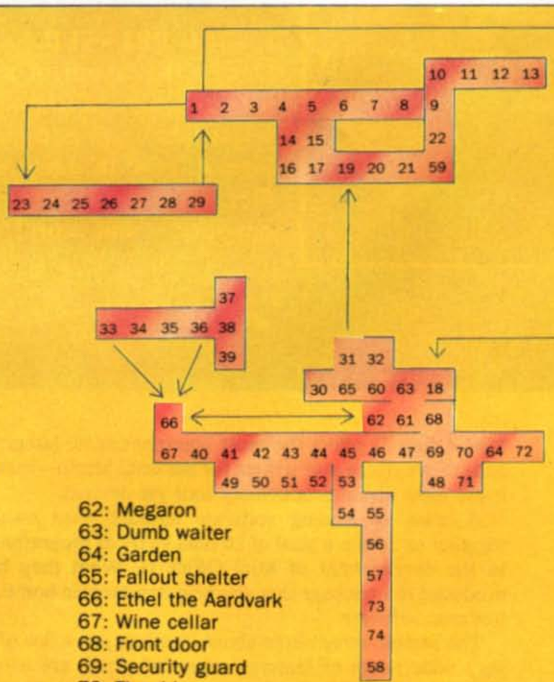
Well done Ian. Can we have the same for Yie Ar Kung-Fu II?

● *Next month we will be looking at the star of the show, or at least of my postbag: Repton 3.*

Jet Set Willy II – The map

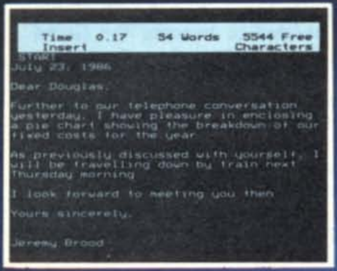
Room names for JSWII:

1: Beam me down Spotty
2: Captain Slog
3: Alienate
4: Ship's computer
5: Main lift (top)
6: Phaser power
7: Sickbay
8: Foot room
9: Someone else
10: Maria in space
11: Banned
12: Flower power source
13: Star drive
14: Defence system
15: Main lift (middle)
16: Photon tube
17: Main lift
18: The bathroom
19: Docking bay
20: Starship
21: Aye 'appen
22: The trouble with Tribbles is
23: Teleport
24: Galactic invasion
25: Incredible
26: Hole
27: In the ground
28: Loony jet set
29: Beam me up Spotty
30: Master bedroom
31: Rocket room
32: Belfry
33: The outlet
34: In the drains
35: Nasties
36: Sewer entrance
37: Mega Hill
38: Holt Road
39: Downstairs
40: Trip switch
41: Willy's lookout
42: Sky blue pink
43: Potty pot plant
44: Rigor mortis
45: Crypt
46: Decapitare
47: Money bags
48: Highway to Hell
49: Wonga's spillage tray
50: Willy's bird bath
51: Seedy hole
52: The zoo
53: Pit gear on
54: In t'rat hole
55: Down t'pit
56: Water supply
57: Well (top)
58: Drinking water
59: Shuttle bay
60: Macaroni Ted
61: Butler's pantry



62: Megaron
63: Dumb waiter
64: Garden
65: Fallout shelter
66: Ethel the Aardvark
67: Wine cellar
68: Front door
69: Security guard
70: The drive
71: Under the drive
72: Off licence
73: Well (middle)
74: Well (bottom)

All this in just



```
 Time   0.17   54 Words   5544 Free
 Insert                  Characters
START
July 23, 1986

Dear Douglas,

Further to our telephone conversation
yesterday, I have pleasure in enclosing
a pie chart showing the breakdown of our
fixed costs for the year

As previously discussed with yourself, I
will be travelling down by train next
Thursday morning

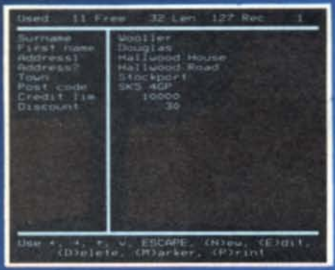
I look forward to meeting you then

Yours sincerely,


Jeremy Brood
```

WORD PROCESSOR

Compose a letter, set the print-out options using embedded commands or menus, use the mail merge facility to produce personalised circulars – and more!

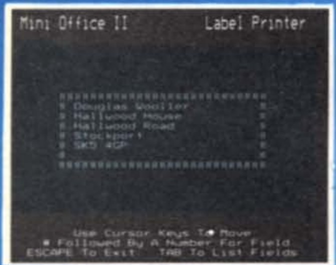


```
Used   11 Free   32 Len  127 Rec    1
Surname       Wooller
First name    Douglas
Address1      Hallwood House
Address2      Hallwood Road
Town          Stockport
Post code     SK5 4GP
Credit lim        10000
Discount             30

Use ↑, ↓, ←, ↓, ESCAPE, (N)ew, (E)dit,
     (D)elete, (M)arker, (P)rint
```

DATABASE

Build up a versatile card index, use the flexible print out routine, do powerful multi-field sorting, perform all arithmetic functions, link with the word processor – and more!



```
Mini Office II            Label Printer


      ################################
      # Douglas Wooller              #
      # Hallwood House               #
      # Hallwood Road                #
      # Stockport                    #
      # SK5 4GP                      #
      #                              #
      ################################


        Use Cursor Keys To Move
     # Followed By A Number For Field
  ESCAPE To Exit    TAB To List Fields
```

LABEL PRINTER

Design the layout of a label with the easy-to-use editor, select label size and sheet format, read in database files, print out in any quantity – and more!

70
60
50
40
30
20
10
0
J F M A M J J A S
PRODUCTION COSTS
DATABASE SOFTWARE
Mini
Office
Mini Office II
Main menu
Word Processor
Database
Spreadsheet
Graphics
Communications
Label Printer
Exit Mini Office II
Use cursor keys to choose
then press RETURN
(c) Database Software 1986

...and at a price

Mini Office II offers the most comprehensive, integrated suite of programs ever written for the BBC Micro – making it the most useful productivity tool yet devised.

A team of leading software authors were brought together to devote a total of 26 man years of programming to the development of Mini Office II. What they have produced is a package that sets new standards in home and business software.

The sample screenshots above illustrate just a few of the very wide range of features, many of which are usually restricted to software costing hundreds of pounds. Most are accessed by using cursor keys to move up and down a list of options and pressing Enter to select.

Is it that easy to use? Several leading reviewers have already sung its praises on this very point.

Yet possibly the best advertisement for Mini Office II is that it comes from the same stable that produced the original Mini Office package back in 1984.

That was so successful it was shortlisted in two major categories of the British Microcomputing Awards – the Oscars of the industry – and sold in excess of 100,000 units!

It was up to Mini Office II to take over where the first Mini Office left off, with 32 extra features, two additional modules, a program to convert existing Mini Office files to Mini Office II format, and a 60 page, very easy to follow manual.

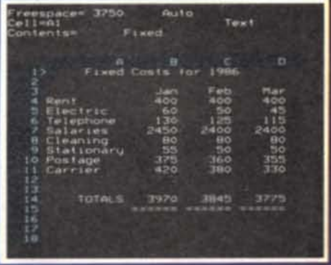
This is the package thousands of BBC Micro owners have been waiting for – and at a price everyone can afford!

ONE package!

CUMANA
BBC
Micro

SPREADSHEET

Prepare budgets or tables, total columns or rows with ease, copy formulae absolutely or relatively, view in either 40 or 80 column modes, recalculate automatically – and more!

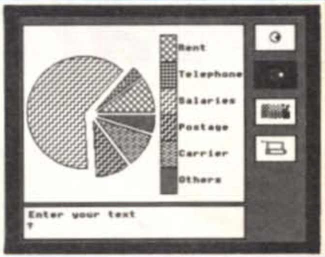


```
Freespace= 3750      Auto
Cell=A1                     Text
Contents=      Fixed

             A         B         C         D
 1>       Fixed Costs for 1986
 2
 3                    Jan       Feb       Mar
 4  Rent              400       400       400
 5  Electric           60        50        45
 6  Telephone         130       125       115
 7  Salaries         2450      2400      2400
 8  Cleaning           80        80        80
 9  Stationary         55        50        50
10  Postage           375       360       355
11  Carrier           420       380       330
12
13
14          TOTALS   3970      3845      3775
15                 ======    ======    ======
16
17
18
```

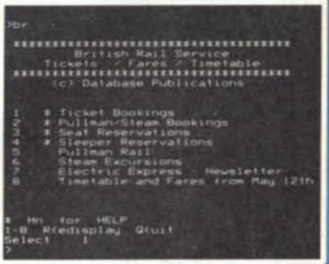
GRAPHICS

Enter data directly or load data from the spreadsheet, produce pie charts, display bar charts side by side or stacked, overlay line graphs – and more!



COMMS MODULE

Using a modem you can access services such as MicroLink and book rail or theatre tickets, send electronic mail, telex and telemessages in a flash – and more!



```
>br

 ****************************************
          British Rail Service
     Tickets  / Fares / Timetable
 ****************************************
       (c) Database Publications

 1    # Ticket Bookings
 2    # Pullman/Steam Bookings
 3    # Seat Reservations
 4    # Sleeper Reservations
 5      Pullman Rail
 6      Steam Excursions
 7      Electric Express - Newsletter
 8      Timetable and Fares from May 12th


#  Hn  for  HELP
1-8  R(edisplay  Q(uit
Select     1
>
```

that can't be matched!

Here's what some independent reviewers say about Mini Office II:

Menus throughout the program were abundant and well structured, allowing complex choices to be made with hardly a glance at the pocket-sized spiral-bound manual, and offering a wealth of user-defined functions . . . For the money it really is unbeatable. Dedicated word processors, spreadsheets and comms packages may offer some extra facilities, but some are so full of whistles and bells you may find yourself forever in the manual or even not using half of their power. What you get with Mini Office II is a valiant attempt to provide an all-embracing small business package at a down to earth price; it fulfills all its promises, and there's nothing cut-rate about the facilities it provides. – **Viewfax 258 (Prestel)**

BBC Model B and B+

Cassette £14.95
$5\frac{1}{4}$" disc £16.95

Voted Business Program of the Year – 1985 AND 1986

"Popular Computing Weekly"

'This package is incredible value. It includes a word processor, database, spreadsheet, graphics display, label printer and communications module. You could well spend over £200 to get the same range of functions if you bought separate programs from other firms.'

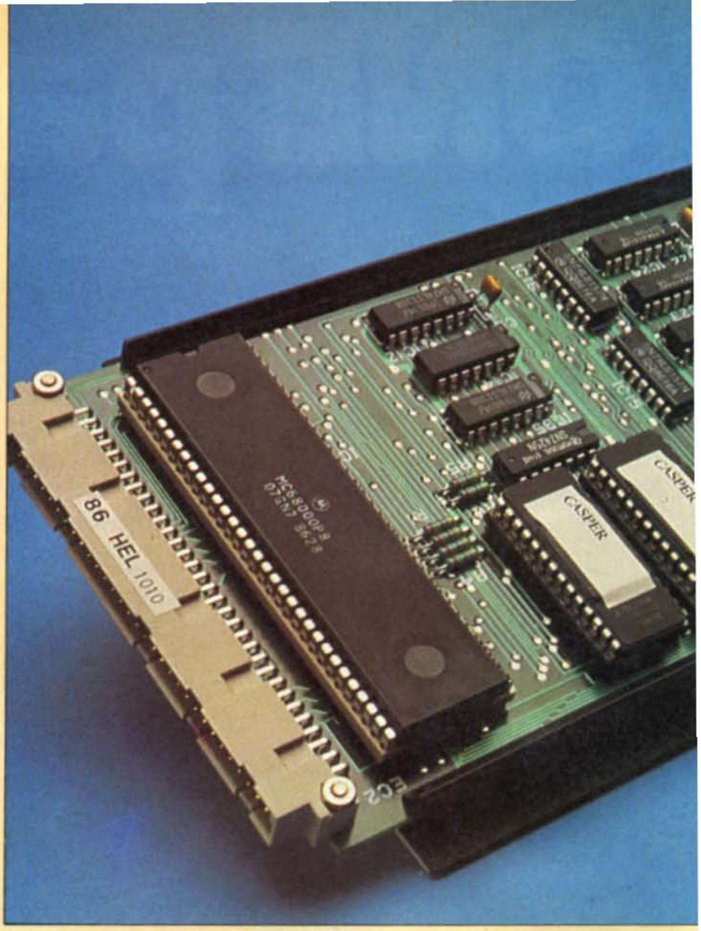
"Daily Mail Home Computing Guide"

DATABASE SOFTWARE

Order form on Page 159

Mike Cook looks at a powerful and flexible 32-bit second processor

The go-faster board



Product: Casper 68000 second processor
Price: £299
Manufacturers: C.A. Special Products, Moss Way, Donibristle Industrial Estate, Dunfermline, Fife.
Tel: 0383 823928

THE 68000 must be one of the most desirable processors currently available. It has a 16 bit data bus with a 32 bit internal architecture.

That means that each time data is read into the microprocessor it reads 16 bits at a time – twice as many as the BBC Micro – and that all internal registers are 32 bits wide, as opposed to 8 bits on the microprocessor in the BBC Micro.

This alone would make it fast and powerful but the 68000 also has a superb instruction set which makes it quite excellent.

The 68000 Casper second processor contains a true 68000 – there is a device called a 68008 which has the same instruction set but only an 8 bit data bus. This means that it has to perform two fetch cycles for every one the 68000 performs thus slowing it down by approximately half.

This device is used in the ill-fated Sinclair QL and some other so-called 68000 second processors on the market. In my opinion, this is a compromise best avoided.

So the Casper 68000 second processor actually contains a 68000. It's a very large 64-pin chip covering the whole width of the 100mm by 250mm board, along with two 8k eproms, 128k bytes of dynamic ram and two VIAs.

One disappointment is that there is only a 4MHz clock to run the system and the processor is capable of running at 8MHz. I suspect this is to simplify the memory interface but it does halve the possible speed from the system.

The board plugs into the Tube connector and derives its power from there. It can be mounted internally in the BBC Micro by attaching it to the lid using sticky-backed foam pads on the plastic mounting rails that hold the board.

On the far end of the board is a 64-way Euro-connector which will allow expansion of the system. To complete the package there are two sideways roms to fit and two discs containing tests, examples and utilities. The two roms contain a linker and an assembler, the latter being the one written by Crossware.

68000 programming

The Casper 68000 second processor can be programmed by using either the assembler or the monitor, a simple program that allows you to examine and change memory locations and execute a program – back in the dark ages of the seventies this was the only piece of software to be shipped with a micro.

The monitor will also perform other functions, such as transferring blocks of memory from the BBC Micro into the second processor, cataloguing discs and even single stepping through your program.

But while it is quite feasible to program any of the 8 bit microprocessors using a monitor, it would soon drive you insane trying the same trick with the 68000 because the instruction bytes have data and addressing mode bits embedded in them.

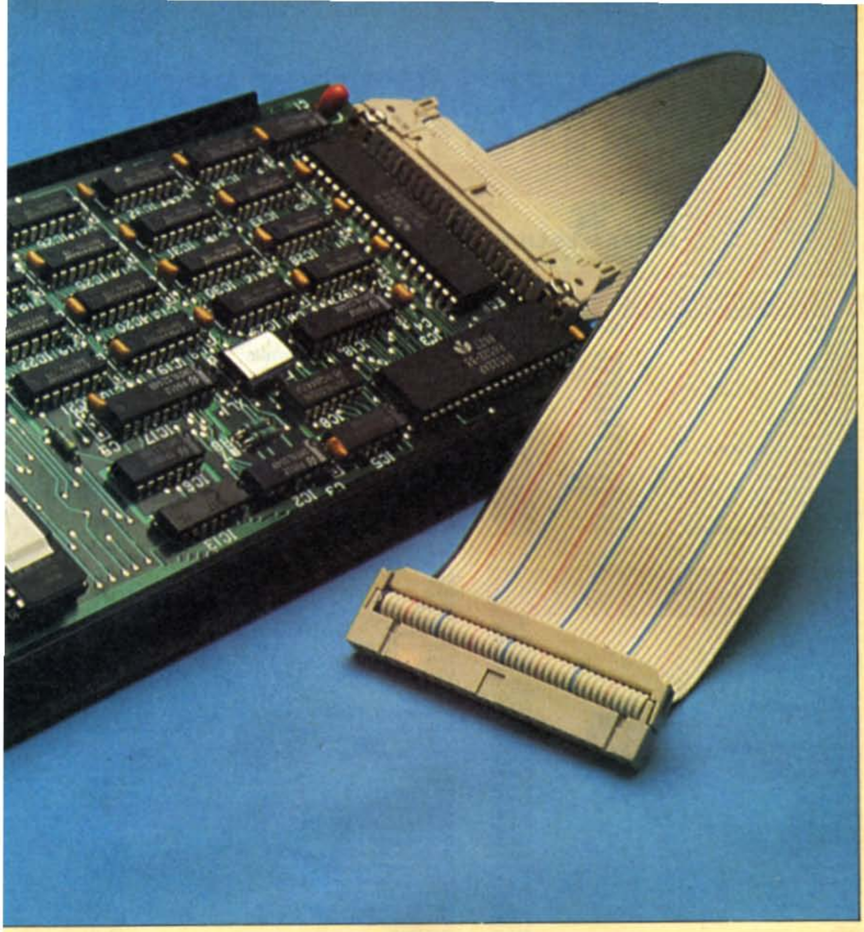
Therefore to work out an instruction you would have to start out with the basic skeleton bits, add your options and then convert the whole lot into hex. After a few sessions of that you would be glad of an assembler.

The assembler supplied actually converts Basic's built-in assembler to use 68000 op-codes. So you use this assembler from within the Basic environment you are already familiar with, which means that you have to have Basic II fitted otherwise nothing will work.

The 68000 assembler is invoked using *MCODE in place of the right-facing square brackets of the built-in 6502 assembler. A left-facing square bracket terminates both assemblers.

Due to the way this works, the Basic IF statement is awkward to use within the assembler, so a multi-line IF . . . THEN . . . ELSE . . . ENDIF statement is provided by Casper for conditional assemblies. A *VDUMP command is supplied to list all the variables used in an assembly.

The spiral-bound manual is printed on high quality glossy paper but curiously shaped – about the size of an A4 page



folded in half lengthways and thus long and thin. It is sub-divided into three sections: User Manual, Assembler and Teaching, with this section taking 73 of its 121 pages.

The User Manual describes how to fit the 68000 Casper second processor and the instructions understood by the monitor. It also lists the entry addresses of some monitor subroutines that can be incorporated into your own programs. This is useful to allow your programs to communicate with the BBC Micro.

A memory map of the system is given, (see Figure I) but it is wrong to label the lower 128k as rom because there is only 8k of it. The system input and output has 64k allocated to it whereas in fact it consists of just 32 bytes. We are not told in the manual whether this is uniquely decoded – an important consideration when adding your own expansion.

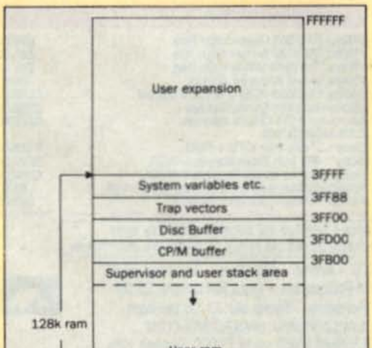


Figure I: System memory map

The 68000 chip has 1k of memory devoted to vectors of all sorts, but as this area is in rom you can't alter them. The exception is the 16 trap vectors that are re-vectored through ram.

This means you can use the TRAP instructions for your own programs but other forms of exception processing, like interrupts and errors, are effectively removed from your control.

Other 68000 processor systems have an arrangement whereby this area of memory that contains the vectors is first assigned to rom and then, during the power-up sequence, is switched to be ram. The 68000 Casper second processor is much simpler and keeps a stable memory map.

The pin-out of the 64-way expansion plug is shown in the manual.

Basically the signals consist of the address and data bus, the control signals and a few decoded memory slots. However, no explanation is given as to what these signals might be.

This is all right for the standard processor signals but we are given no clue as to what $\overline{\text{RAM5}}$ might signify. In short I would have liked to see much more in the 21 pages that comprise the user manual.

The Assembler manual, on the other hand, appears to be much more comprehensive. It describes how to use the assembler and what pseudo-op codes there are along with the assembler's error messages.

The assembler has the ability to utilise sideways ram if fitted and you can write even larger programs using an overlay facility.

The teaching guide gives a brief introduction into the techniques of programming the 68000 chip and consists of a number of tutorials. The first walks you through the monitor and its operation and is very detailed in what key you need to press and why. The other sections use the assembler and some files on one of the discs.

After explaining what to do it asks you to make simple modifications to the routines to test and improve your understanding of what is going on. The routines themselves do nothing spectacular, just move blocks of memory about, but that is a good place to start learning and most of the basics are covered.

I thought this section was the best piece of the whole package as it gives you a toehold on the workings of the processor and at the same time allows you to become familiar with the system. There is a limited amount of information about the 68000 processor but for a full picture of this device you need to buy one of the many books devoted to it.

Who's it for?

Well, who would use the 68000 Casper second processor? The answer must be anyone who wants to learn about the 68000 processor on a limited budget. It must be a very attractive package to Colleges and Universities that teach the 68000 processor and its architecture, and who have a number of BBC Micro systems already.

I would not recommend it as a first instruction set to learn since it is quite complex, so I am not sure how suitable this is for schools, but it is a logical progression from the 6502 instruction set. Nevertheless the 68000 Casper second processor represents quite good value for money.

For those interested in high level languages there is a version of C available for only £99. It is not a full implementation but should be suitable for control purposes.

Apart from the manual not containing as much information about the board as I would like, I found the teaching section very well written and thought out. All in all, if you are in the market for this sort of product the 68000 Casper second processor would seem to fit the bill quite nicely. ■

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Steve Turnbull offers a utility to end a reader's star command clash

Unacceptable interception

> *I have a Disc Doctor rom, by Computer Concepts, fitted in rom position zero, and a Watford Electronics DFS in position 11. When I want to format a disc with *FORM, Disc Doctor intercepts it. This is fine because I prefer the decreased access time due to Disc Doctor's skew formatting.*
>
> *But when I want to edit the function key definition with *EDIT, the DFS intercepts it instead. Can you tell me why?* – **Terry Paul, Stockport.**

THIS problem is due to the way that the MOS presents star commands to the roms.

First it checks the command against its own list of commands, including *CAT, *BASIC and so on. If the command is not recognised by the machine operating system – MOS – it is passed to the roms.

Each rom has a position number from zero to 15 and each is accessed in turn from highest position to lowest position by being presented with the command via the rom service entry using call code four.

When the rom receives the command, it is compared with its own list of options and, if recognised, carries the command out.

If the command is still unrecognised after each rom has been checked, the operating system sends the command to the filing system. But the filing system is a rom, and so should already have been accessed once. So why again?

The answer lies in the fact that the DFS in the BBC Micro has two separate lists of commands. One is of common commands, such as *TYPE, and the second list is of commands specific to the disc system itself, for example *INFO, called intrinsic commands.

The common commands are accessible whatever filing system is in use, so you can *DUMP a file from cassette via the cassette filing system – CFS – or from rom via the rom filing system – RFS – and so on.

It is this list of common commands which is checked during the sequential access of the roms by the MOS. So if two roms have the command *EDIT in their lists the higher priority rom will intercept it and carry it out.

The second access is to the currently active filing system. The rom is entered via the filing system control vector – FSCV – using code three.

This entry is provided so that fast access filing systems, such as the disc system, can take the command and if it is not in the second list of options it can search the file media for the filename to load and *RUN.

If the filing system is not a rapid access device – for instance the CFS – it does not go to the file media but simply returns the Bad command error. Otherwise you could spend minutes waiting for an attempt to find a mis-spelt star command on the tape.

In the Master and Compact micros all the common commands have been moved into the MOS and out of the DFS. This means that all filing system specific DFS, ADFS, CFS and RFS commands are accessed via the FSCV, but all common commands are handled by the MOS.

So the final answer to the original question – if you haven't worked it out yet – is that the *EDIT command is treated as a common command by the Watford Electronics DFS and because the rom is in the high priority position, it is this rom which intercepts the command first.

But *FORM is an intrinsic command for the DFS, and so is intercepted by the Disc Doctor first before it has a chance to reach the intrinsic list of the DFS.

Figure I shows the route that star commands take when processed by the MOS.

To overcome your problem, you can use the utility listed here to bypass the standard * command route, and send commands directly to the rom of your choice, or to the current filing system.

After you have typed in the listing make sure that you save the program before you run it, because any errors could corrupt your original. The program installs itself automatically when run, but you can save the machine code with:

```
*SAVE stars C00+100
```

Once the program has been installed – after running the source code or by typing:

```
*stars
```

from disc – it is invisible to the user until the *LINE command is used.

*LINE provides a standard entry to machine code via the MOS. When a *LINE command is processed a jump is made via the user vector – *userv* – with the accumulator set to one and X and Y containing the address of the rest of the command line.

To use the utility from immediate mode or from within a program use *LINE, then the position of the rom as a single hexadecimal digit followed by the command that you want to send.

The program first ensures that there is some text following *LINE using the general string initialisation routine –

Turn to Page 52 ▶

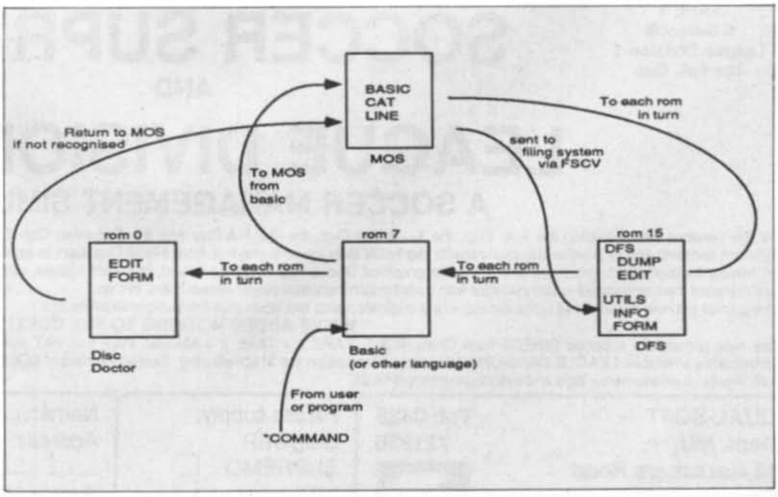

Figure I: The route taken by star commands

◀ *From Page 51*

gsinit – and if no text follows the error Bad *LINE is returned.

Next a search is made for either a single hex digit or the character >. If a hex digit is found two checks are made, first to ensure that there is a rom in the required rom position, returning Bad ROM if there is none. And second that the rom has a service entry to jump into, otherwise you get the No service entry error.

Once the tests have been satisfied the command is sent to the rom. For instance:

```
*LINE 0 EDIT
```

will call the soft key edit routine from Disc Doctor if it is in position zero.

Where the character > has been found the command is sent via the FSCV to whatever filing system is active, for instance:

```
*LINE > LIST text
```

will run a program called LIST without it being recognised and intercepted by the DFS common command list.

```
    1 REM  *LINE COMMANDS
    2 REM by Steve Turnbull
    3 REM (c)The Micro User
   10 osbyte=&FFF4
   20 gsread=&FFC5
   30 gsinit=&FFC2
   40 select=&FE30
   50 servic=&8003
   60 userv=&200
   70 fscv=&21E
   80 rom=&F4
   90 ptr=&F2
  100 off=&7F
  110 romtab=&7D
  120 C%=&C00
  130 FOR L%=0 TO 2 STEP 2
  140 P%=C%
  150 [OPT L%
  160 .start
  170  LDX #myvec MOD256
  180  LDY #myvec DIV256
  190  STX userv:STY userv+1
  200  LDA #170:LDX #0
  210  LDY #255:JSR osbyte
  220  STX romtab:STY romtab+1
  230  RTS
  240 .myvec
  250  CMP #1:BNE exit
  260  STX ptr:STY ptr+1
  270  LDY #0:SEC
  280  JSR gsinit:BEQ badlin
  290 .gethex
  300  JSR gsread:STY off
  310  CMP #ASC(">"):BEQ file
  320  SEC:SBC #&30:BMI badhex
  330  CMP #10:BCC normal
  340  CMP #17:BCC badhex:SBC #7
  350  CMP #16:BCS badhex
  360 .normal
  370  TAX:TAY:LDA (romtab),Y
  380  BEQ badrom:BPL noserv
  390  LDA rom:PHA
  400  STX select:STX rom
  410  LDA #4:LDY off:JSR servic
  420  TAX:BNE notrec
  430  PLA:STA select:STA rom
  440 .exit RTS
  450 .file
  460  CLC:TYA:ADC ptr:TAX
  470  LDA ptr+1:ADC #0:TAY
  480  LDA #3:JMP (fscv)
  490 .badlin OPT FNerr(127,"Bad *LINE")
  500 .badhex OPT FNerr(126,"Bad HEX")
  510 .badrom OPT FNerr(125,"Bad ROM")
  520 .noserv OPT FNerr(124,"No service
entry")
  530 .notrec OPT FNerr(123,"Not recogni
zed")
  540 ]:NEXT:CALLstart:END
  550 DEF FNerr(E%,t$):LOCAL K%
  560 K%=LENt$:?P%=0:P%?1=E%
  570 $(P%+2)=t$:P%=P%+K%+3
  580 P%?-1=0:=L%
```

Finally, if a command is returned without being intercepted, the error message Not recognised is generated.

And that just about wraps up the handling of star commands. Next month there will be another complete answer to one of your letters, so keep the questions coming into Letters, *The Micro User*, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY. ■

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Your technical questions answered by MIKE COOK

PROBLEM SOLVED

Joystick testing

I HAVE a joystick that will not work and as it's the first one that I've had I don't know if the fault is with it or my micro. When I returned it to Voltmace for checking it was returned to me with no explanation – and still not working.

The fault is that the cursor goes to the bottom right hand corner and will not move but the fire button works. – **Michael Williams, Bridgwater, Somerset.**

● *There are two possibilities here. It could be that the joystick is faulty or it could be your computer and there is really no way of telling from your description.*

Try your joystick on someone else's computer and see if it works or alternatively test your computer's analogue input port.

If you have no test equipment you could try a rough and ready test. Write a program to continuously display the readings from all the analogue input channels (using the ADVAL statement).

Then slightly moisten your fingers and press them against the analogue input port connector on the back of the BBC micro. If the numbers change then it is unlikely that your computer is faulty.

Video hook-ups

AFTER experimenting with the setup that connects a BBC Micro to a video recorder from the July 1985 edition of *The Micro User* I have obtained some excellent results.

But I would like to know how to overlay computer graphics on to a pre-recorded video picture.

Is there a way of connecting two video input plugs to a recorder by means of a splitter? – **N.R. Mistry, Blackburn, Lancs.**

● *You can't use a splitter to mix two video signals as the synchronising pulses of the two signals must occur at exactly the same time for the pictures to mix properly.*

To do this you need a special modification to your BBC Micro or other video source to lock the two signals together. This is known as a "genlock" system, is quite complex and can cost several hundred pounds.

If you want to pursue the matter further contact 62 Systems, 5 Mead Lane, Farnham, Surrey GU9 7DY.

Buggy building

I WOULD like to build myself a buggy that will work on the BBC Micro but my problem is that I cannot figure out a program to get it to work.

Could you please send me a program listing and a plan on how to build a buggy and how to get it working with the BBC Micro? – **J. Staniforth, Nottingham**

● *Why should I design a buggy for you when it is quite interesting to learn yourself and it would take me about a week and you are not paying me?*

A buggy is simply a vehicle with a motor driving a wheel on each side so essentially all you need to know is how to control motors from your computer.

Look no further than the Body Building course May 1984 for information about how to drive stepping motors or November 1985 for how to drive DC motors.

If you do not fancy that then virtually every book on BBC Micro interfacing contains something on buggies: Try DIY Robotics and Sensors with the BBC Computer, J. Billingsley, (Sunshine Books) 1983.

Switch setting

I HAVE two separate TEAC Disc Drives and a Watford Electronics double cable. However, the internal DIP switches need to be set so that one of the drives recognises that it is drive 1. Could you please tell me how to set these switches? – **David Machin, London.**

● *Well, I don't think I have been asked how to throw a switch before. I think you want to know how to identify the correct switch.*

The layout of the switches is different on all makes of drive and there are even different TEAC assemblies. Open it up and look for a row of switches or links the size of a 14 pin IC.

On the switch or the board you will find three, sometimes four switches labelled 0 1 2. You will find both drives have switch 0 made and the others not.

On one drive unmake the one labelled 0 and make the one labelled 1. If you have links instead of switches you might have to solder a link across the one labelled 1.

Mains control

I NORMALLY leave the on/off switches of my BBC Micro and monitor in the on position, using the mains socket switch to start up and close down the whole system.

Someone has told me that this practice is bad, particularly for the monitor. Please can you tell me if that is true and, if so, explain the difference?

Also, my disc drive is powered from the micro and the supplier told me that surges due to switching off and on could corrupt any disc left in the drive with the hatch closed.

Consequently, I always remove discs when I reset the machine (say after a lock-up). Should I continue to do this, or is it an unnecessary precaution? – **Nigel Reed, Langford Budville, Somerset.**

● *Like the curate's egg, your advice is good in parts. I can see no reason why you should not control your system from the mains switch. I have been doing this for years with a whole room full of BBC Micros.*

However, it is good practice to remove your discs before powering down as this could damage their contents. Normally it is sufficient simply to open the drive door as this prevents the head from making contact with the disc

Second processors

I RECENTLY purchased a BBC Model B with Solidisk 1770 DFS and ADFS. Shortly after this, I was offered an Acorn 6502 second processor and the Bitstick.

When I had finally fitted all the fiddly bits, I found it to be incompatible – the problem seems to arise due to the 1770 DFS clashing with the 6502 second processor around zero page locations.

Is there any possible way I could get the 6502 second processor and the Bitstick to work with my 1770 DFS? Also is it possible to have an Acorn DFS and my 1770 DFS installed at the same time? – **Ian Roberts, Sheffield.**

● *There is no reason why the 1770 system should not work with the second processor. However, in order for the second processor to function you need the DNFS fitted (not the DFS) to copy the tube software into the I/O processor.*

If this is fitted in a lower priority rom socket than the 1770 DFS then the 1770 DFS will be active. When I use the second processor with the Watford DFS the DNFS has also to be fitted.

I am surprised to hear that any disc file server is using page zero memory locations. It should not as there is an area reserved for them.

Audio problem

I USE a BBC Model B with issue 4 board and it is in constant use. Recently when the computer is on the speaker emits a very loud crackling noise, particularly when a program is being run or the Break or Escape keys are pressed.

I am at a loss what to do as this has only just started and I have checked inside for loose or bad connections. The terrible noise does not affect the normal operation of the computer. – **Greg Page, Tollesbury, Essex.**

● *This is simply a loose connection but finding it could prove a problem. It is most probable that it is in the audio circuitry and this can be found in the lower right hand corner of the board.*

Turn to Page 54 ▶

Your technical questions answered by MIKE COOK

PROBLEM SOLVED

◀ *From Page 53*

Also you could try removing the audio chips if they are in sockets to see if a pin is bent under the chip and only making intermittent contact.

Finally, check the 15 volt lead that comes in on the edge of the board as the sound chip and serial chip system are the only sections to use it and it could be faulty without affecting the rest of the system.

Keyboard cleaning

OVER the three years that I have had my BBC Micro it has had quite a lot of use.

During the last month or so I have noticed that one or two of the keys are beginning to stick a bit. They do not always come up quite as quickly as they ought to and they feel a bit stiffer to press than the others.

This particularly affects the most used keys such as the Return key and the spacebar. I do not know whether this is a result of dirt getting into the keys or just wear.

Is it possible to clean the mechanism of the keys and if so what is the best way of going about it? – **David Harper, Wollaton, Nottingham.**

● *The plunger in the key switch sometimes sticks because dirt accumulates around it and you can clean it with switch cleaner.*

If you carefully prise off the key tops you will see a channel going into the switch body. Spray a little switch cleaner and pick out the dirt with fine tweezers or a cocktail stick.

Finally you can place a few drops of Electrolube on the slider. This is a non-drying electrical lubricant which will give the keys a smooth action and at the same time collect dirt.

But once started this process might have to be repeated every few years.

Program translation

PLEASE could you tell me whether it is possible to write a program on the BBC Micro to translate disc programs from an ICL Basic disc.

Also, is it possible for a 40 track disc drive to play games or read data from an 80 track disc using software and/or hardware?

Can double sided discs be read at all using a single sided drive and can you recommend a good rom for tape to disc transfers? – **John Terry, Luton, Beds.**

● *First the good news: It is always possible to write a program to translate one version of Basic to another. Now the bad news: It will only work for the most trivial of programs that do not utilise the hardware of the system (like the Graphic capabilities).*

A 40 track disc drive has a head that is twice as wide as an 80 track drive and therefore when reading an 80 track disc with a 40 track drive you will be reading two tracks at once.

No hardware or software can possibly make any sense of this. If you try to read a double sided disc in a single sided drive by inserting it the wrong way round the disc spins in the opposite direction and so all the pulses are in the reverse order, again no sense can be made of this.

Any tape/disc transfer rom has to make assumptions about the protection methods it will encounter therefore none can be guaranteed to work under all conditions.

Push button control

PLEASE can you tell me how a push button or perhaps two could be connected to the BBC Micro and used via the ADVAL commands. If this is possible please could you tell me where I could buy the sockets and switches? – **Paul Welch, Colyton, Devon.**

● *Simply connect one push button between pins 3 and 10 and the other between pins 6 and 13 of the 15 way D-type connector.*

You can then easily read this with an ADVAL(0) AND 3 statement. This will give a value of 3 when no button is pressed and 0 when both are pressed.

If only one button is pressed the value will be 1 or 2 depending which is being pressed. The plug and switches can be obtained from Watford Electronics.

Compatibility queries

I OWN a BBC Model B machine with Watford's 32k shadow ram board and MK2 extension rom board. The only other roms I've got so far are the DUMPOUT3 and a Greek-English Word Processor which was originally made in Greece.

Is the Challenger 1.3 compatible with the above and can I use the shadow 32k ram? Also, is it compatible with the software and hardware that exists for BBC Micros?

I don't mean games or the like, but programs like Mini Office II. Finally, as I am not aware of the usual commands of any DFS or DDFS, do those of Challenger 1.3 have the same capability as, say, Acorn's DFS or Watford's DDFS? – **Nicholas Conides, Athens, Greece.**

● *Any filing system that is not the original Acorn DFS runs the risk of not being compatible with some software but I see no reason to suppose that the roms you have installed will not work.*

The major difficulty for compatibility comes from either protection systems or clever programmers. Many packages are software protected and unfortunately usually neither the supplier of the software nor the hardware manufacturer will know what to do with Z80, not the 6502. product.

The sad fact is that you will have to consult those famous French engineers Messieurs Suckit and See.

The Challenger will not use the shadow ram but its commands are quite adequate for the needs of any disc user, as are virtually all alternative DFSs.

As to the compatibility of anything with anything else my motto is always "be surprised when it works not angry when it doesn't".

Generating interrupts

I AM having trouble finding out about interrupts. The books I have do not explain it enough for beginners like myself, and the colleges round here only know what to do with Z80, not the 6502.

I have two stepper motors and I am trying to get them to draw a circle. I managed to do it using a look up table but I use up a lot of memory especially with a large circle.

Using interrupts, one for each motor, would get round the problem and give me the speed I am after, as I am using a stepper driver that can spin the motor to 3000 pulses a second.

How do you set up the time for each interrupt? – **Terry Leaman, Waunllwyd, Ebbw Vale.**

● *Interrupts are a way that an external device can call a subroutine. If you understand the Z80 interrupt structure then the BBC Micro works in a similar way to the Mode 1 interrupt level on the Z80.*

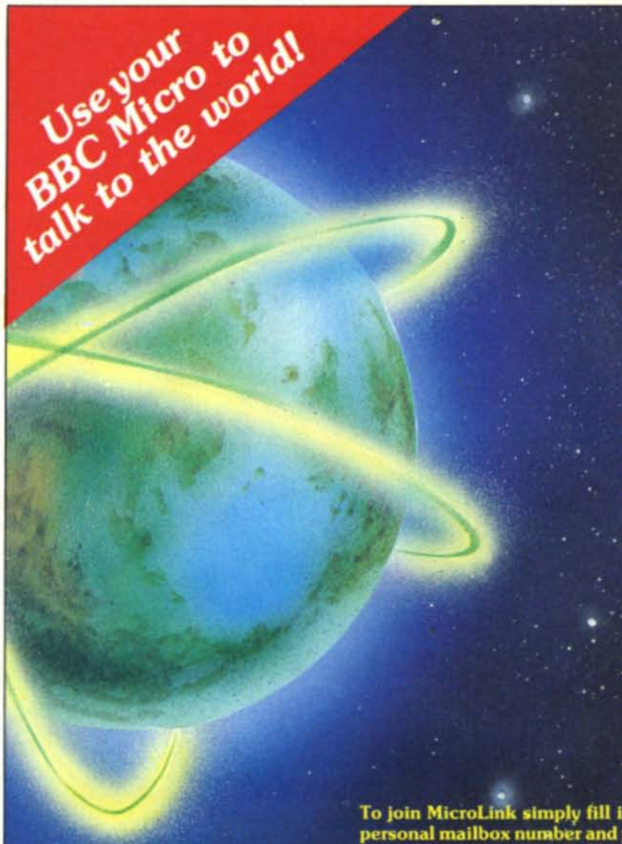
As there are many devices interrupting the BBC Micro, service routines have to look at what device caused the interrupt before it knows what to do. This could be reading the keyboard, getting characters out of buffers or reading the analogue to digital converter.

You can generate your own interrupts from the user port VIA and they can be made to occur at regular intervals by use of timer 1. For further details of this see the Advanced User Guide.

As to the second part of the question, I am a little puzzled. Interrupts will not help you speed up driving a stepping motor at all.

If you want to draw a circle and do not want to use a look up table then you need an algorithm to generate the pulses.

A good one is Bresenham's Circle Algorithm which can be found in most quality graphics texts books like Procedural Elements for Computer Graphics by D.F. Rogers, (McGraw Hill) 1985.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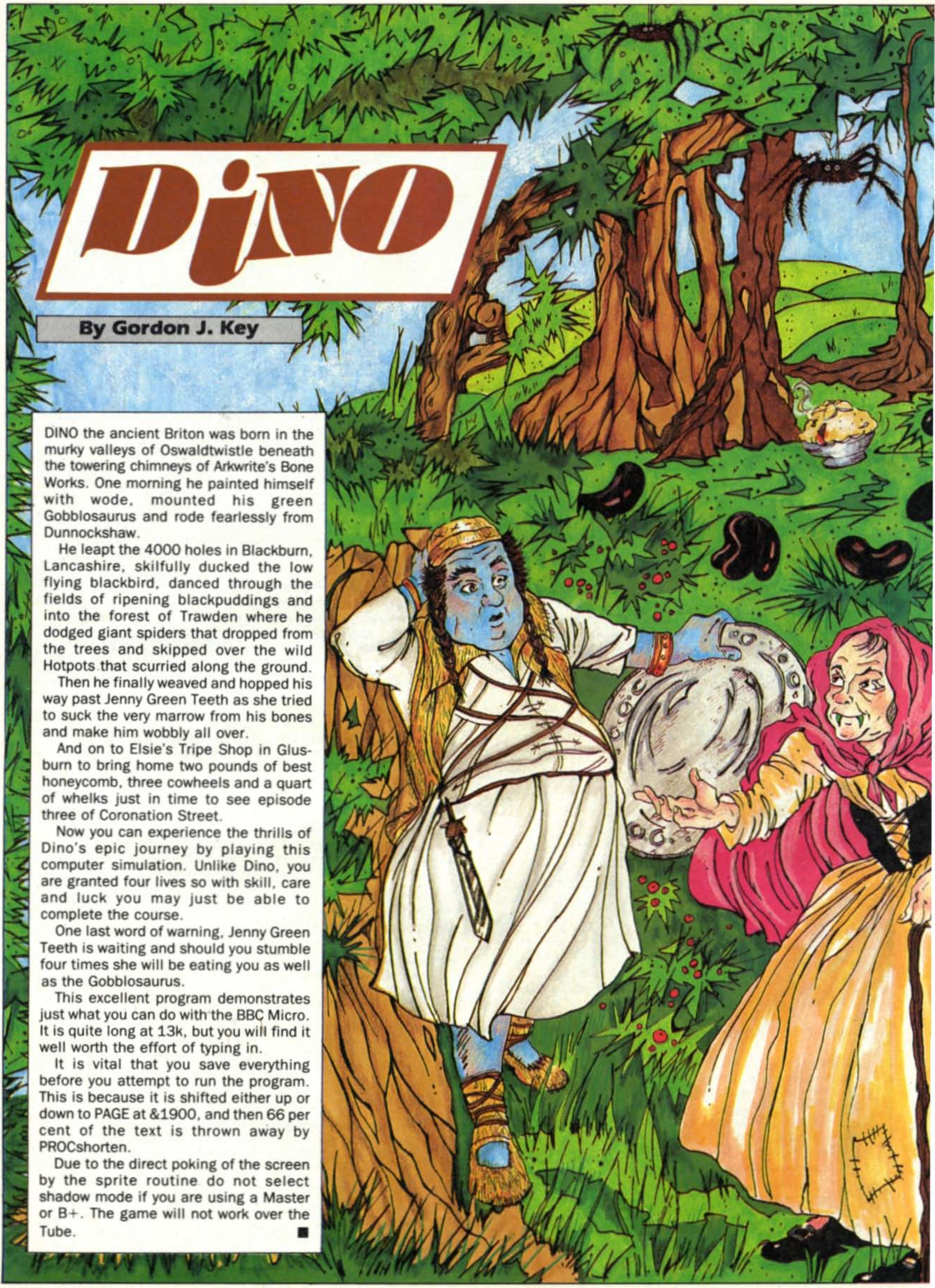

DINO

By Gordon J. Key

DINO the ancient Briton was born in the murky valleys of Oswaldtwistle beneath the towering chimneys of Arkwrite's Bone Works. One morning he painted himself with wode, mounted his green Gobblosaurus and rode fearlessly from Dunnockshaw.

He leapt the 4000 holes in Blackburn, Lancashire, skilfully ducked the low flying blackbird, danced through the fields of ripening blackpuddings and into the forest of Trawden where he dodged giant spiders that dropped from the trees and skipped over the wild Hotpots that scurried along the ground.

Then he finally weaved and hopped his way past Jenny Green Teeth as she tried to suck the very marrow from his bones and make him wobbly all over.

And on to Elsie's Tripe Shop in Glusburn to bring home two pounds of best honeycomb, three cowheels and a quart of whelks just in time to see episode three of Coronation Street.

Now you can experience the thrills of Dino's epic journey by playing this computer simulation. Unlike Dino, you are granted four lives so with skill, care and luck you may just be able to complete the course.

One last word of warning, Jenny Green Teeth is waiting and should you stumble four times she will be eating you as well as the Gobblosaurus.

This excellent program demonstrates just what you can do with the BBC Micro. It is quite long at 13k, but you will find it well worth the effort of typing in.

It is vital that you save everything before you attempt to run the program. This is because it is shifted either up or down to PAGE at &1900, and then 66 per cent of the text is thrown away by PROCshorten.

Due to the direct poking of the screen by the sprite routine do not select shadow mode if you are using a Master or B+. The game will not work over the Tube. ■

VARIABLES

A%	Value returned by the screen functions.
B%	Bounce value for PROCfall.
C%,X%,Y%	Dinos call variables, also some local usage.
D%	Collision flag.
E%	Constant value of &84.
F%,G%,H%	Values to be added for sprite animation.
I%	Used to read the tune data.
L%	Number of lives.
N%	Pointer for data storage.
O%	Flag for spider movement.
P%	Check value for TIME.
Q%	Call address for the sprite routine.
S%	Current screen number.
T%	General counter.
U%,V%	End of screen flags.
W%	Flag for Jenny movement.
Z%	Flag for Blackbird's song.
a%,b%,c%	First sprite call variables.
d%,e%,f%	Second sprite call variables.
g%,h%,i%	Third sprite call variables.
j%,k%	Used to control the rate of bounce when Dino falls off the saurus.
m%	Status flag.
s%	Current score.
w%	Delay variable used by PROCdel.
c%,x%,y%	Used locally for sprite animation.
hs%	High score.
xa%,ya%	Used to animate Jenny in PROCgetspc.
cd%,xd%,yd%	Used to animate the Hotpot in PROCdash.
A$	Used by PROCshorten to isolate the word THEEND.
$&390	The current high score name.

Full listing starts on Page 146 ▶

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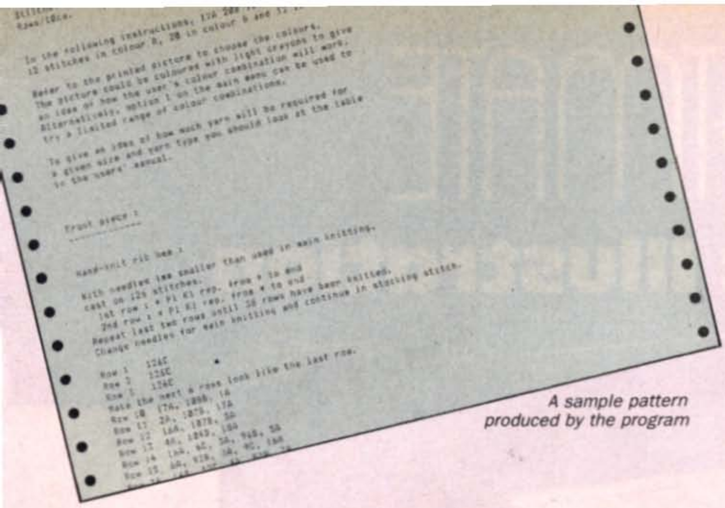


```
In the following instructions,
12 stitches in colour A, 28 in colour B and

Refer to the printed picture to choose the colours.
The picture could be coloured with light crayons to give
an idea of how the user's colour combination will work.
Alternatively, option 1 on the main menu can be used to
try a limited range of colour combinations.

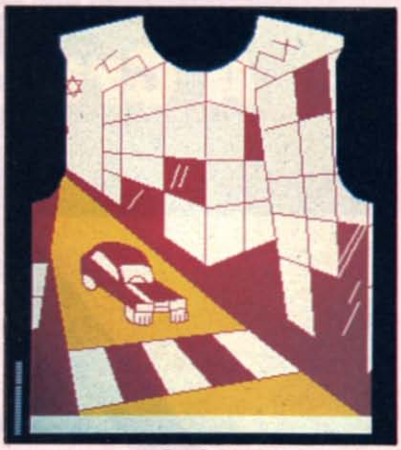
To give an idea of how much yarn will be required for
a given size and yarn type you should look at the table
in the users' manual.

Front piece 1
-------------

Hand-knit rib band

With needles 1mm smaller than used in main knitting,
cast on 125 stitches.
  1st row : * P1 K1 rep. from * to end
  2nd row : * P1 K1 rep. from * to end
Repeat last two rows until 18 rows have been knitted.
Change needles for main knitting and continue in stocking stitch.
```

A sample pattern produced by the program



The finished design tank top

Software for knitwear . . .

Product: Knitting Softwear
Price: £51.50
Supplier: Newsight, Reliance House, 340 Clapham Road, London SW9 9AT
Tel: 01-627 3148/9

Elisabeth Dennis tries her hand at a pattern producing package

I SEEM to spend quite a lot of time knitting. It's not that I'm sitting at home with my feet up all day – quite the opposite. I'm often in the car waiting for piano or ballet lessons to end so that I can drive the children to the next of their many social engagements.

Knitting has the advantage that it is easily portable and, unlike reading, can be done while attending to other things.

I therefore leapt at the chance to review Knitting Softwear (lovely pun) from Newsight. The idea behind the menu-driven program is to design patterns for knitwear. Anything that can take some of the toil out of this must be worth investigating.

The package consists of a high quality manual, a rom – which seems to contain very little useful code – and either 40 or 80 track disc where my first problem arose: It's double-sided. I have only a single-sided drive, as have most of my friends, but I managed to borrow one eventually.

To make full use of the package you'll also need a colour TV or monitor and a suitable printer. For the latter, the manual specifies an Epson RX-80 or compatible dot matrix machine.

Basically the package allows you to create a colourful picture for the front of tank top sleeveless pullovers, save the file to disc for future use, and print out either the pattern itself or the knitting instructions required to create it.

It gives no choice of texture or shape, which is limiting but could still be quite useful. Only three colours are allowed but these can be changed to any of the BBC Micro's actual colours.

A design sub-menu gives a choice of four patterns – random pattern, random sine wave, tesselation or free sketching.

I tried each in turn and found both the random variants a little boring. On the other hand, the tesselation was nice and with a few tries I produced some interesting designs.

The free sketching was rather disappointing, given the range of graphics packages that are readily available for the BBC Micro.

There is an option to fill an enclosed area. I couldn't see the lines clearly enough to spot an occasional missing pixel so my attempts to fill invariably bled across the whole screen. Unfortunately there isn't an undo or delete last move option so the only alternative was to save the design after every little addition.

I spent a long time trying to produce a pattern in the free sketch section and got more and more frustrated by its primitive nature.

You can import pictures from other graphics packages as long as they are in Mode 1 format and have only three colours, none of which can be black.

I eventually settled on one of my tesselation designs and used that to get a printout of the pattern. I tested this on an Epson FX-100 which is basically an FX-80 with a longer carriage.

When printing the pattern instructions for a design there is an interminable wait, then the program simply outputs a long string and relies on the printer to supply a line feed.

With normal width paper in the FX-100 a large part of the instructions was printed on the platen. I tried setting the right-hand margin before running the program, but that didn't work. I suspect, that like many programs, this one resets the printer before starting. The only solution was to resort to wide paper.

Using this I got the "knit 1, purl 2, knit 2 together" kind of instructions for knitting my design. However, like most people, when I'm knitting I prefer to work from a chart instead of the stitch instructions, and this would enable me to use the pattern on other garments (like long-sleeved pullovers).

It is possible to produce a graphical stitch map of the garment but the width is restricted to 120 stitches. By reducing the size of my original pullover from 12 to 8 — well, it might fit one of the kids – I got the program to agree to produce the chart. "Printing – Please Wait" flashed on the screen and the printer did nothing more than execute a series of form-feeds. Half an hour's experimentation, and many sheets of paper later, I gave up.

Printing machine instructions was no better. If you've got an intelligent knitting machine that runs from cards, you'll still have to convert the knit 1, purl 2 to holes on the card. The option to print the chart yielded the same form-feed farce.

Casting off . . .

To be fair, I can't recommend this package. I had hoped to knit some samples which could be photographed for this review, but after spending a lot of time over several weeks, I was left with little more than frustration and disappointment.

At just under £50, I consider this software expensive. It is a good idea but poorly implemented, slow and of very limited use. Frankly, until someone produces a much better package I'll stick to graph paper and felt-tip pens. ■

PLOTMATE

A Graphic Illustration

'Plotter' is too simple a word to describe PLOTMATE. It is, in effect, a highly sophisticated data communications device that greatly extends a micro system's options and capabilities allowing high resolution input and high definition output. It is compatible with all leading micros including the BBC, IBM, AMSTRAD, ATARI and NIMBUS.

PLOTMATE A3M with Linear Graphics' high resolution image scanner — LINSCAN.

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HPGL	By expanding the on-board graphics language range PLOTMATE understands commands from HPGL 7475A/7470A industry standard languages enabling compatibility with BITSTICK, AUTOCAD, LOTUS 123, SUPERCALC 3, CHARTMASTER and many others.
IMAGE SCANNING	PLOTMATE's flexibility is further extended by the use of Linear Graphics' own scanner, LINSCAN. This allows PLOTMATE to function as a sophisticated image scanner producing high resolution pictures that can be used within desktop publishing packages such as Pagemaker, GEM, Fleet Street Editor and Image.
EXTENDED GRAPHICS COMMANDS	The in-built graphics commands of the BBC micro that PLOTMATE understands now encompass the extended graphics commands of the BBC Master such as circle and arc drawing, sector and segment filling, rectangle and parallelogram shading.
DOMESDAY	All 'Welcome' disks allow data files produced by the DOMESDAY database to be output in pie, bar and line chart format on the BBC Master.

Not content with providing this wealth of technical capacity Linear Graphics have even introduced a unique discount scheme for primary and secondary schools — the 'Educational Support Scheme.'

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EDUCATION NEWS

Swadelands teach-in for teachers

SWADELANDS school in Kent, already well known for its weather satellite pictures and the Swafax viewdatabases, will play host to over 100 Kent secondary school teachers from March 9 to 16.

The school has been chosen as the venue for an in-service training for teachers initiative.

It is the latest in a series of courses funded by the Manpower Services Commission to encourage teachers in Kent to become aware of new technology.

Already many of them have enjoyed a day away from the classroom to get hands-on experience of computing.

There has been an overwhelming response from UK software houses to a request for assistance from organisers of the latest TRIST event.

First to offer help was Database Software which sent Instant Mini-Office II, the top-selling 6-in-1 package, and French on the Run.

Teachers attending the course will attempt to escape from World War II German-occupied France. O Level French will take the teachers most of the way – A Level is needed for a successful journey.

Many other major software houses will be strongly represented at the computer awareness course – including Logotron, Commotion, Control Technology and Minerva Systems.

Secondary school teachers on the course will receive expert instruction on how to communicate easily with other schools and huge mainframe databases using a modem.

Among the databases they will explore are Teletel, the French database now accessible by PSS, Prestel and MicroLink.

With Swafax's three telephone lines it will be possible to log on to all three and compare them.

New Swafax faciities are being offered to callers and schools are invited to log on to the system during the period of the course to explore the enlarged database and to send messages.

Schools with a Swafax mailbox can demonstrate online editing of their minidatabase, or demonstrate uploading and downloading of programs.

Swafax youngster Mark Horlock at work on the system that is teaching teachers about new technology.

Readers of *The Micro User* are also invited to log on. The Swafax numbers are 0622 850440 and 0622 858304.

Also on Swafax will be a minidatabase by Healthdata, the work of London doctor Christopher Dobbing. A full, regularly updated version of Healthdata, including the very latest information on AIDS, can be found on 01-986-4360.

Another attraction for teachers is the Weather Station. They will be shown how to capture pictures from polar orbiting satellites such as NOAA 9 and NOAA 10 and perhaps the Russian ones.

Even more interesting will be pictures obtained from the European Space Agency's geostationary satellite, Meteosat which transmits images regularly during the day.

Tap in to the weather

A NEW weather map decoder has been designed by *Micro User* reader James Bailey.

He saw an article on Swafax a year ago and it inspired him to design a low-cost Fax recorder.

He now has a workable device. When it is connected to a short-wave radio and a dot matrix printer, weather maps showing isobars, sea temperatures and the position of icebergs in the Atlantic can be obtained from Russia, Germany, France and Bracknell.

A database designed for youngsters

PUBLISHER Chalksoft claims its latest release First Filer is the first database program specifically designed for young children.

Author Andrew Davis, a senior lecturer at Homerton College, Cambridge, says it "avoids the awkward syntax and funny words loved by some so-called children's databases".

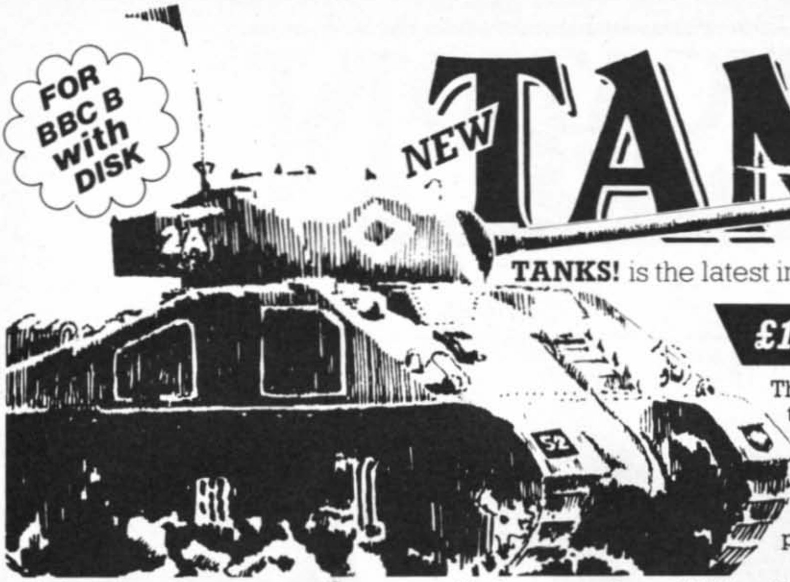
First Filer is menu driven and comes complete with worksheets which help children use the program.

Files contain up to 500 records and input may be in upper or lower case. Chalksoft says mistakes are easily remedied, and creating, changing and printing files are skills which are easy to learn with the help of the worksheets.

First Filer for the BBC Micro and Master costs £17.35, £19.35 for the Master Compact.

The package includes three ready-made databases on which the worksheets are based – birds, food, mammals – matching keycards, teacher guide and worksheets.

FOR BBC B with DISK



NEW TANKS!

TANKS! is the latest in our unique series of battlegames.

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The game simulates a Second World War tank battle. You choose from three scenarios: Western Europe 1944. North Africa 1942 or Russia Winter 1943. Then you may choose you forces. **TANKS!** is one player, and you play against the computer.

Action takes place on a scrolling map, with the enemy forces hidden. You must consider the quickest route to your objective, avoid or defuse the mines placed by the opposing forces, hide from marauding enemy bombers, negotiate enemy fortified positions, or destroy them with artillery or mortars. You must keep your tanks refuelled, but protect your valuable petrol trucks. Oh, and of course, you will also have to fight the enemy tanks.

TANKS!, like **SINK THE BISMARCK** is split into sections on disc, which allows a much larger program than would otherwise be possible. For instance, TANKS! is 14K of pure machine code and 18K of data, but runs in hi-res colour MODEs.

SINK THE BISMARCK

'Sink The Bismarck' is the first of a new generation of wargames for the BBC Micro with disc drive. The game is split into several sections, each of which is loaded from disc when required.

'Sink The Bismarck' simulates the conditions in the North Atlantic in May 1941, as the British Home Fleet was despatched to catch and destroy Bismarck. But with a dozen troop and supply convoys in the Atlantic, time was of the essence. You must also consider the strengths and weaknesses of each of your ships, weather, U-boat attacks and fuel limitations.

"Sink The Bismarck has the perfect balance between pure strategy and an arcade game."
Micro User January 1987

"If you've never tried a warfare simulation before them may I suggest that this would be a good place to start? Well designed, playable and good value for a disc-based game."
A&B December 1986

£10.99 plus £1.00 p&p

SINK THE BISMARCK for the BBC Micro with disc. Compatible with all BBC variants and filing systems.

Available from: Design People Software, 77 Grimwade Street, Ipswich, Suffolk IP4 1LN, or from good distributors.

It's all Greek to Sciways

NEW Sciways rom from Mayhew Telonics allows printing of science-based characters and symbols on both the micro screen and an Epson or compatible printer.

The entire Greek alphabet is supported, together with all the main scientific and mathematical symbols.

Superscript, subscript and user-defined characters can also be printed.

As Sciways is a utility and not a word processor in itself, it can be used with most existing word processors and also from Basic and other languages.

A major application is expected to involve the use of Sciways to allow educational software to be written with realistic screen displays.

Sciways runs on the BBC Micro and Master 128 and costs £33.50.

Science lab on a video disc

FOR schools that encourage budding scientists, Futuremedia has released an interactive science laboratory on videodisc.

Produced in conjunction with the Department of Trade and Industry and publishers John Wiley and Sons, it allows the student to interact with the videodisc and conduct a series of complex experiments.

These include chromatography, distillation, electrolysis and AC circuits – all without the danger associated with real experiments, or the need for expensive laboratory equipment.

Futuremedia managing director Peter Copeland points out that a real gas chromatograph would cost £15,000. But it can be safely "blown up" on the videodisc and reappear for use moments later.

The interactive science laboratory works on the BBC Micro or Master, keyboard or mouse operated, and a Philips laservision 83 or BBC Domesday Player.

The videodisc and accompanying floppy discs are being sold at a package price of £350.

Colleges' cornucopia

THE High Technology and Equipment in Education exhibition held at the Barbican, London, proved to be a cornucopia for BBC Micro-owning schools and colleges.

One of the highlights was the preview of Acorn's network fileserver, Filestore, which will end the need for schools with Econet to tie up a micro in order to run the file and printer server software.

Filestore is a true stand-alone system requiring neither keyboard nor monitor and is simple to start up thanks to a battery-backed memory which holds the factory-set default parameters.

Fully compatible with Level 3 fileservers and capable of servicing up to 80 stations, the system provides all fileserver processing functions and includes 20Mb hard disc and printer server with parallel port.

Acorn says the system is between three and six times faster than existing fileservers, and at £1,500 comes £600 cheaper than its nearest comparable competitor.

British Thornton launched Compass Starter, the first in a series of computer aided design packages for the BBC Micro and Master.

Aimed at schools implementing new courses including CAD and advanced manufacturing technology, the program provides comprehensive facilities for drawing and editing complex shapes, manipulating screen images, storage and retrieval and using a database.

Features include autodimension, fillit, grid, hatch, text and zoom, as well as manipulative routines such as repeat, reflect and rotate.

Logotron launched an adventure writer for use with its Pendown word processor on the BBC Micro, Master and Compact.

Children can not only play adventure games but can create their own by first defining the text of a page and then the program to allow player interaction.

Once this has been done the computer assembles the pages into the adventure story, checking all the time that the program and story structure are valid. Pages may be saved and used in different stories, or for other purposes.

The Advisory Unit, Microtech in Education, launched two programs for the BBC Micro, Master and Compact.

Twin program Fads enables children to explore the world of clothes design. Module 1 allows users to dress a human figure in clothes of their choice selected from the program's "wardrobe". In Module 2, clothes can be designed and mixed with those from Module 1. Price £25.

Quest, from the same source, is an information retrieval package built around a database containing information on various subjects including history and geography.

Statistical and graphical utilities are available which facilitate the creation of bar charts and graphs. Price £27.

Commotion had a general purpose interface called Beasty Plus on offer. It allows the BBC Micro and Master to control various construction models such as Lego.

The package comes with software and its own built-in control language, plus a selection of motors, buzzers and light bulbs. Price £199.

Three new educational programs for the BBC Micro and Master were launched by GSN Software.

Chemistry in Action is a simulation of iron and steel creation. Youngsters have to select the correct method for producing the metals from a series of options, and determine how to remove impurities.

A Place to Live is based on pond life and has a database containing details of 44 creatures existing in such stagnant environments.

The database can be interrogated and youngsters can also create their own pond and define up to 10 creatures which may live there. The program will then provide details about the way of life of the creatures chosen.

Geography Today contains information on rivers and slopes. Histograms and bar charts are plotted to follow the course of rivers and associated natural erosion. Users can define their own rivers and slopes and analyse them accordingly. The three programs cost £17.95 each.

Email service for schools

ESSEX County Council has not only sent the free DTI modem to all its schools with secondary pupils, it has also installed a dedicated telephone line for each one at the County's expense.

The cost of the first year's telephone calls will also be met by Essex and if schools do not abuse the service the bills for subsequent years will also be paid.

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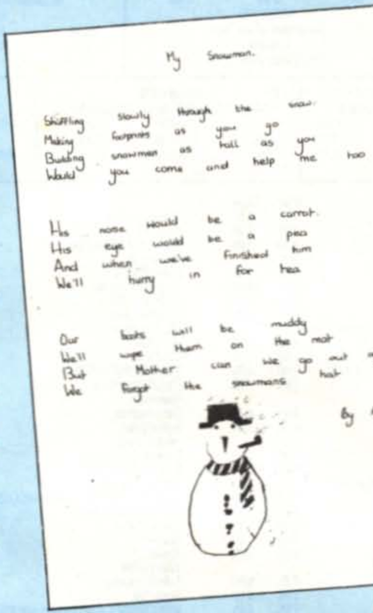


My Snowman.

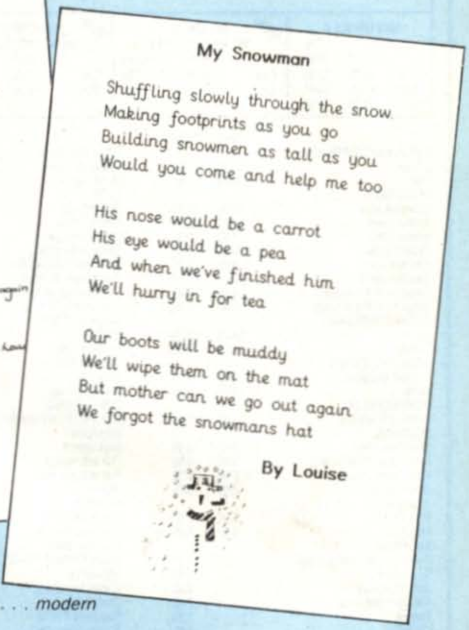
Shuffling slowly through the snow
Making footprints as you go
Building snowmen as tall as you
Would you come and help me too

His nose would be a carrot.
His eye would be a pea
And when we've finished him
We'll hurry in for tea

Our boots will be muddy
We'll wipe them on the mat
But Mother can we go out again
We forgot the snowmans hat

By Lou

Traditional . . .



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We'll wipe them on the mat
But mother can we go out again
We forgot the snowmans hat

By Louise

. . . modern

Primary value of word processing

By Andrew Heaton

SEVERAL years have passed since micros were introduced into primary schools and their rate of acceptance is accelerating.

Initially they we just treated as additional pieces of equipment to be used like televisions, video recorders or slide projectors – as teaching aids.

Many of the early software packages available to primary schools were only for drill and practice and although well received by pupils they were of little educational value.

The introduction of radical innovations is often greeted with suspicion and scepticism, so with the rather weak software available were micros doomed from the start?

In some cases the answer, sadly, is yes. But for those who persevered through the early formative years micros can now be seen as an important additional feature of the primary curriculum.

They are the agents of fundamental change and this change needs to be carefully managed. There has been considerable outside pressure to adopt micros in schools and this has caused many teachers to feel quite insecure – especially as children appear to be more easily able to cope than the teachers themselves.

The past 18 months has witnessed many primary schools adding word processors to their software collections.

By using micros in this role, children are given powerful tools which respond in a friendly, rewarding manner. The tiresome task of physically putting pen to paper is removed as they concentrate on the creative processes in their work.

Group work is often discouraged in language work, but word processors give children an ideal opportunity for collaborative work. They can discuss ideas, language and layout while learning together. And, once they are familiar with the software, the creative processes of drafting, editing and revising may be carried out.

Children are on new ground now because previously their first attempt in a book with a pencil had to produce the finished result. Now they are asked to constructively look at and change their work.

The initial interest and incentive will still remain as they modify their text, and when their work is complete it can be saved on disc for future use and any number of copies produced.

As well as encouraging children to write and correct their work, word processors allow them to overcome handwriting difficulties and presentation problems – a positive asset with younger pupils.

By using concept keyboards, word processing can even be introduced to pre-school children.

These keyboards are designed for children with special education needs and offer teachers a very effective, efficient and powerful aid to learning.

With little effort or skill they can produce professional software for any child or group of children, based on their work and needs. Words can be replaced by pictures and simple matching games devised.

Children can then work without using the computer keyboard. This is important to many infants who are unable to recognise the upper case letters, and the surrounding function keys only serve to further baffle them.

Self-produced keyboard overlays can be as simple as a few pictures with words and phrases or just a lower case alphabet with a shift and delete facility.

Does this method of learning justify the expense? Using a word processor eases the transition from oral to written language. It stimulates, gives children more purpose and can be very easily integrated with and enhance work in the classroom.

Whatever stage or word processing children are at, their critical faculties improve as they examine their own or others work.

Word processors are not just fancy electronic typewriters. They are an effective way to plan, write, refine and record ideas – and are an essential part of any school's AVA equipment. ■

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EDUCATION SOFTWARE

Another look at Logo

Program: Honeylogo
Price: £16 (disc plus handbook), £28 (school pack)
Supplier: Glentop Publishers, Standfast House, Bath Place, High Street, Barnet, Herts. EN5 5XE.
Tel: 01-441 4130

MANY wonderful claims were made about the educational advantages of using Logo in the classroom. To date most of those claims remain unsubstantiated, and are viewed with scepticism by the majority of teachers.

Sales of the various Logo chips have proved to be very disappointing, underlining the lack of faith most have in Logo.

It is rather a shame that so much was claimed, as with much lower ideals and aims Logo can be a useful resource in the classroom.

Perhaps the hardest thing for a teacher wishing to implement Logo is trying to find out what he or she should do with it. This is where Honeylogo scores.

It is a disc-based Logo (hence the more reasonable cost) and the school pack contains a wealth of ideas for its use.

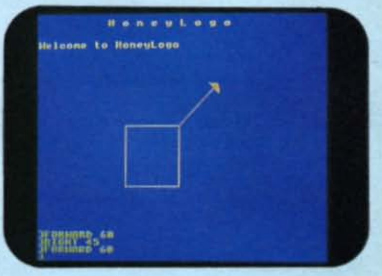
Honeylogo is not new, it has been on sale for about two years, but it has recently been updated and enhanced making it a very useful starting point for anyone wanted to try Logo out.

The latest version (version 3) will now work on the BBC Master and offers several new commands.

Logo is a language that lets you communicate with the computer using a set of ordinary English words and phrases. As such it provides a useful working environment for planning and testing work.

Many children are encouraged because, although the results of the instructions may not be what the child anticipated, they are not wrong — only different.

Honeylogo not only has a good version of turtle graphics, but also it introduces the concept of text manipulation. The BBC Micro's sound and colour can also be used.



```
                HoneyLogo
Welcome to HoneyLogo

>FORWARD 60
>RIGHT 45
>FORWARD 60
>
```

A useful feature of Honeylogo is an Epson screen dump facility that can be called from within a procedure or directly. It is also possible to print out a procedure.

The school pack contains the software, the handbook (about 250 pages long), an A4 pupil's handbook and a set of 21 A4 stiff workcards providing extra project material.

Existing Honeylogo users will be pleased to note that Glentop does an update service on earlier versions of its software.

Philip Andrews

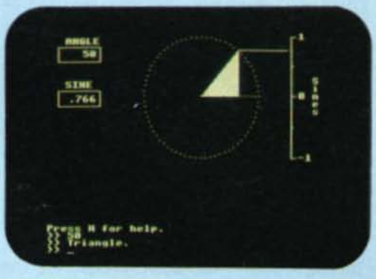
Useful maths topics

Program: Teaching With a Micro – Maths 1
Price: £12 (disc)
Supplier: The Shell Centre, University of Nottingham, Nottingham NG7 2RD.
Tel: 0602-506101

THIS is a suite of five programs with a mathematical theme. The majority can be used as the basis for a lesson, others are more suitable as computerised illustrations.

The first program, Decode, is suitable for use by both English and Maths departments. A large paragraph of text is displayed on the screen, encoded using a letter substitution method. Your task is to analyse the text and decide which "real" letters are represented by the ones on the screen.

If you are having difficulty getting started the computer can be called upon to produce a histogram of the frequency with which the individual letters occur. As E and T are the most frequently used letters in the English language they are a pretty good starting point.



```
Press H for help.
>> 50
>> Triangle.
>> _
```

In Plod you play the role of a chief of police who must utilise his manpower as economically as possible and still provide the city with adequate police cover.

The city is laid out as a rectangle and can be up to eight by six blocks in size. Officers can be placed on any intersection and can see a distance of one block. When you have finished placing your men you can ask the computer to display the optimal solution.

Salesman is a program in which you must choose the shortest route between 10 towns. It illustrates two methods of tackling this problem with a computer.

The first is an exhaustive search in which the computer tests each of the 3,628,800 possible routes. The second employs a "three cut method" which, although not guaranteed to give the shortest possible route, will get very close much quicker.

A town-to-town mileage chart is provided in the booklet so that you can make your own estimates before running the computer program.

Sincos is a routine which illustrates how the sine and cosine of an angle vary as you increase and decrease its size.

The final program is Vector, a treasure hunt game in which you guide a turtle around a grid to a hidden treasure. You have to enter both positive and negative vectors in order to control the turtle.

The teachers' notes are most useful, often suggesting ways in which pen and paper work can be run in parallel with the computer. Maths 1 is an interesting set of programs which cover a wide range of topics.

Hannah Frances

Heroin horror story

Program: Smack
Price: £18.50 plus VAT (disc only)
Supplier: Daco Software, 59 Mackenzie Road, Birmingham B11 4EP.
Tel: 021-449 2253

SMACK is a program for secondary school pupils and young adults which aims to deter them from trying heroin.

The package is supplied on three discs, two of which contain the program and another for storing the progress of pupils who don't complete the program in one session.

Each session takes the form of a series of multiple choice questions. Your response to each question determines the route the program takes through each scenario.

There are eight randomly selected opening scenarios, including a pop festival, a trip to Paris, a party, and a friend's house. From any of these situations you can take your first step along what soon becomes an increasingly downward spiral.

As you become more involved in the situation you begin to feel the depression and helplessness of your imaginary life.

The ill-health, the constant search for money, the progression from smoking to injecting heroin, rejection by your family and friends, hospitalisation and, if you take it far enough, death.

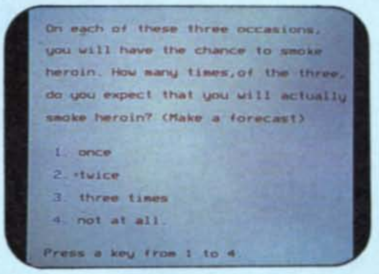
I felt a great sense of relief when I ran through the program a second time, rejecting heroin on all occasions.

When playing the good guy the program links together successive starting scenarios waiting for you to say Yes to heroin.

The program emphasises that all your responses will be erased at the end of the session. This will hopefully encourage the pupil to follow courses of action which would normally be out of character.

The pupil who uses the program as a safe enviroment in which to experience the lifestyle of a heroin user will gain the most benefit from the package.

At any time during a session you can call up a progress report either on the screen or via a printer. This details the effects which heroin addiction has had on your life. Alternatively it highlights what you have achieved by saying No to heroin, and the fate of those around you who weakened.



```
On each of these three occasions,
you will have the chance to smoke
heroin. How many times,of the three,
do you expect that you will actually
smoke heroin? (Make a forecast)

 1. once
 2. twice
 3. three times
 4. not at all.

Press a key from 1 to 4
```

The accompanying documentation is excellent – more than half of the 24-page booklet is devoted to teachers' notes, any one of which could be used as the basis for a group discussion. There is also a comprehensive list of useful addresses and suggested reading on the subject.

Smack is an excellent product which highlights the horrors of heroin abuse and the many ways in which today's youth can be exposed to this danger.

Hannah Frances

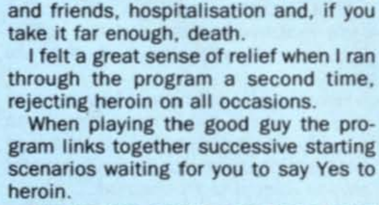
Tour round Tudor England

Program: Tudor England
Price: £9.95 (cassette) £19.15 (40 or 80 track disc) £58.25 (Econet Level 2, 80 track disc)
Supplier: Akadimias Educational Software, University College of North Wales, Bangor, Gwynedd LL57 2DG.

TUDOR England is just one of a series of more than 25 educational titles produced by Akadimias Software. The software company is the brainchild of John Illsley of the History and Computing departments of Bangor University.

The program is based around a multiple-choice format and is intended for use by A level history students, but would be beneficial to some GCSE pupils and even university undergraduates. However, with the multiple options and time categories, this is much more than just another question and answer learning aid.

There are 10 individual units to Tudor England, each covering a particular sphere in this period of history. From the



```
A      Politics & Lordship

Q1.  There was a major revolt in
Kent in 1450.  What was the main
grievance canvassed ?

A1.  The main grievance of  Cade
and his followers was that Royal
Justice  was being perverted  to
serve private ends.

Press Q to quit
or any other key to continue
```

good politics and lordship of Henry VII, through the mid-Tudor crisis, to the religious dissent which culminated in the Spanish Armada, each topic is covered comprehensively and methodically.

Every question is incisive and there may be two or even three probable answers from a range which sometimes extends to seven possiblities.

When you boot the disc you get instructions that are clear and easy to understand even for the non-computer literate student. For me the greatest advantage of this program over similar pretenders is the range of formats each topic can take.

When you choose one you are presented with a choice of Revision, Test or Random Test mode, and a decision can be made depending upon the stage in learning you have reached. In each mode you can then opt for preview, beginner, intermediate or advanced level.

To be successful, you require clear thinking and logical reasoning and not simply the ability to learn rote fashion. Under no circumstances should any Akadimias program be used purely as a substitute for proper reading and research of the subject.

Tudor England incorporates an excellent booklet of topic notes and an exhaustive bibliography of more than 70 associated books.

As a graduate teacher of history I have used this and other Akadimias discs extensively with my students. They have provided good stimulation and almost addictive revision procedures.

To quote one of last year's A level successes, "I actually did find that the different timings and levels of Tudor England helped me think faster and prepare myself for the rigours of the examination".

At almost £10 for the cassette and £19.15 for the disc, Tudor England represents good value for money, but I would think twice about paying nearly £60 for the Econet version. On the whole, however, I have no hesitation in recommending this program.

Nic Outterside

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The only way to do this is to try to pass as a Frenchman, but if your French isn't good enough you risk capture and interrogation by the police or even the Gestapo.

Even the simplest tasks – from buying food to taking buses – place you at risk. And to add to your problems you've got limited funds: "Should I hitch a lift or take the train?", "Do I sell my belongings or get a job?"

Whatever you decide to do, time is short. And there are always people willing to denounce you . . .

French on the Run is that rare combination: A truly educational program that's also a thoroughly enjoyable game. This text adventure not only tests your grammar and vocabulary, but your knowledge of France and the French way of life.

And as your French improves the language problems get harder and the situations become progressively more dangerous. There are four routes to complete in sequence – you need the password from the last before attempting the next. The standard of French required is about O level, though on the last route it rises to just below A level.

And there's a chance for you to try out the French you'll learn in practice: We are offering a FREE WEEKEND IN PARIS as a prize to the first person to get back to England alive, having broken a code near the end of the final route.

For teachers: *French on the Run uses multi-choice questions with randomised distractors, all carefully chosen to illustrate linguistic points or points concerning things French. The program is meant for individual assessment, but can be used just as effectively for classroom work. A sealed envelope contains details of how the secret passwords are created.*

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TO ORDER TURN TO THE FORM ON PAGE 159

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EDUCATION LETTERS

Keep your letters coming in – the education pages are here to reflect your interests. We want to hear your tips, ideas, experiences and suggestions. Send your contributions to:

Peter Davidson, Education Editor, The Micro User, Europa House, 68 Chester Road, Hazel Grove, Stockport, SK7 5NY.

Finding a sailor

I WAS very interested to read your review, Tackling music to good effect, which appeared in the October 1986 edition of The Micro User.

Unfortunately there were no details about the program Jolly Jack Tar which was mentioned.

Is it possible for you to give me the name and address of the supplier of this program as it does sound very useful. **— Mrs Ann Burnie, Falkirk, Stirlingshire.**

● Jolly Jack Tar is produced by Sherston Software, 8 Court Street, Sherston, Malmesbury, Wiltshire SN16 0LL. Tel:0666 840433. It costs £12.

Testing in mono

I WOULD like your recommendations on how I can improve the already useful program, Testing, Testing, 1x2x3, which was in the December 1986 issue of The Micro User.

Not everyone has a colour monitor so could you please give an amendment for just white text? An even more useful amendment would be to select just one good colour, such as yellow, for test. **— G.B. Dean, Didcot, Oxford.**

● If you run the following routine before that or any other Mode 7 program, you will find that the screen remains in the colour of your choice when the program is run.

The numbers requested as you run the short routine refer to the character codes where 129 is red. You will find a table containing all the numbers in the User Guide.

This routine can be incorporated into your own programs but note that PROCASSEMBLE must only be called once. Calling PROCSWITCH switches between full colour and the single colour mode.

```
  10 REM ONE COLOUR MODE 7
   20 REM By Peter Davidson
   30 REM (c) Micro User
   40 PROCASSEMBLE
   50 PROCSWITCH
   60 END
   70 DEFPROCSWITCH
   80 IF?&20E=VEC%MOD256 ?&
20E=&70:?&20F=0ELSE ?&20E=V
EC%MOD256:?&20F=VEC%DIV256
   90 ENDPROC
  100 DEFPROCASSEMBLE
  110 INPUT"COLOUR NUMBER (
129 - 135)",C
  120 IFC<129 OR C>135 THEN
110
  130 VEC%=?&20E+256*?&20F
  140 FORI%=0TO2STEP2
  150 P%=&70
  160 [
  170 OPTI%
  180 PHA
  190 CMP#141
  200 BEQ NOCHANGE
  210 AND#128
  220 CMP#128
  230 BEQ CHANGE
  240 .NOCHANGE PLA
  250 JMP VEC%
  260 .CHANGE PLA
  270 LDA#C
  280 JMP VEC%
  290 ]
  300 NEXT
  310 ENDPROC
```

Percy's prospectus

I WAS very interested to read your item Percy goes public in the January 1987 edition of The Micro User, *particularly in view of your claim that Percy was the world's first computerised college prospectus.*

I hadn't previously thought in these terms, but I should like to put forward the claim of Boston College of Further Education to have got there several months in front of Percival Whitley.

At Christmas 1985 I devised a BBC Micro based version of our college prospectus on 40 track disc.

It went out to all schools in our catchment area in January 1986 and consists of 78 pages of text and graphics using Schoolfax, a viewdata emulator package developed by Ray Burcham at New College, Swindon.

It uses the conventional menu-driven viewdata structure to enable pupils to find out information about our college courses according to subject, area, level of study and entry qualifications.

It was designed to appeal particularly to those pupils who find pages of print rather daunting and offers a more flexible way of accessing the information in our annual prospectus.

In addition it also offers information about college facilities, grants and transport.

The prospectus is also incorporated into the Prestel-type college database which runs on our network. It has been popular with our own students who use it to discover appropriate routes available to them from the courses which they are already on. **— D.J. Stephens, Boston College of Further Education, Boston, Lincs.**

● We know that the Open University had a computerised prospectus with speech output as far back as 1981 but it's always interesting to hear of new products and existing ones that we have not seen.

Our claim in the news item was that Percy is the first authoring package for computerised prospectuses, allowing other establishments to use it for their own prospectus. As far as we know this is still true.

Quad erat demonstrandum

THANK you for the program in the November 1986 issue of The Micro User, *that solved simultaneous equations.*

Another common mathematical problem is solving quadratic equations and factorising quadratic expressions.

The following is a short program which will do this. **– Hung Ngo, Great Malvern, Worcs.**

```
   10 REM SOLVING & FACTORI
SING
   20 REM QUADRATRIC EXPRES
SIONS
   30 REM  by Hung Ngo
   40 REM (c) Micro User
   50 MODE1
   60 VDU23;8202;0;0;0;:VDU
19,1,4;0;
   70 VDU28,5,6,36,1:COLOUR
129:CLS
   80 COLOUR2:@%=&2020A
   90 PRINT'TAB(5)"Factoris
ing & Solving"''TAB(4)"QUA
DRATIC EXPRESSIONS"''TAB(5
)"AX↑2+BX+C=0  By Hung Ngo"
  100 VDU28,1,20,38,12:COLO
UR130:CLS
  110 COLOUR1:VDU19,0,1;0;
  120 REPEAT:com%=0:PRINT"
Three coefficents ";
  130 REPEAT:INPUT"A= "A:I
FA=0PRINT"Silly!"
  140 UNTILA<>0:INPUT"B= "B
"C= "C:CLS
  150 equat=B↑2-4*A*C
  160 IF equat<0 PRINT"Comp
lex roots"'"X=";-B/(2*A);:P
RINT" +/- ";SQR(-equat)/(2*
A)"i":X1=-B/(2*A):X2=SQR(-e
quat)/(2*A):com%=-1
  170 IF equat=0 X1=B/(2*A)
:X2=X1
  180 IF equat>0 X1=(-B+SQR
(equat))/(2*A):X2=(-B-SQR(e
quat))/(2*A)
  190 IF com%=0 PRINTTAB(3)
;"X= ";X1'TAB(3);"X= ";X2:P
RINT'"(";A"X";-A*X1")(X";-X
2")" ELSE PRINT'"(";A"X+";-
A*X1"+"X2"i)(X+";-A*X1"-"X2
"i)"
  200 INPUT'TAB(10)"Anothe
r Go",A$:CLS:UNTIL INSTR("N
n",LEFT$(A$,1))>0
  210 END
```

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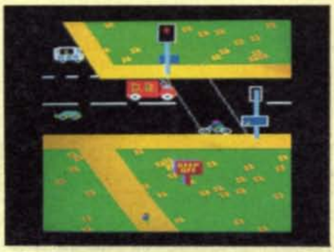

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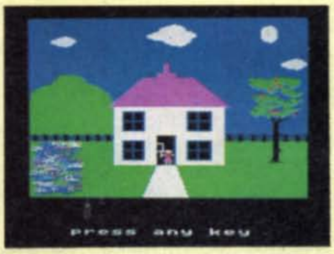
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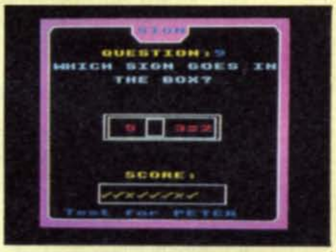
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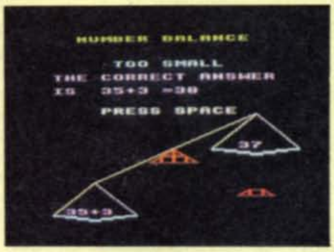
NUMBER BALANCE
TOO SMALL
THE CORRECT ANSWER IS 35+3 =38
PRESS SPACE
37
35+3

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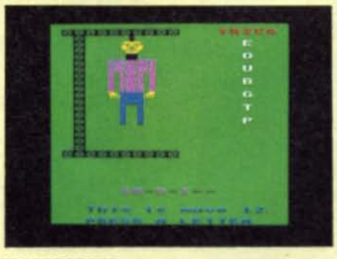
Learn maths the fun way. Type in the answer to balance the scales



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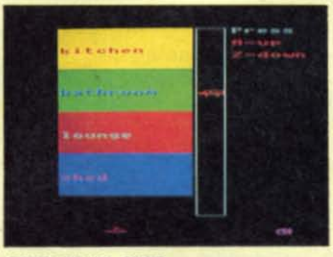

kitchen
bathroom
lounge
shed

ODD MAN OUT
Find the word that does not fit – before your time runs out

TO ORDER TURN TO THE FORM ON PAGE 159

Rog Frost explores radioactive decay

HALF LIFE

DECAY in radioactive elements is a random process, but follows a fairly standard pattern. This program allows students studying maths or physics to investigate that strange phenomenon called Half Life – the time it takes for a decaying substance to halve in size.

This process simulation was designed to help pupils within the radioactivity section of the physics syllabus, but has much wider applications.

The idea is based on an experiment from the 'A' level Nuffield physics course. First throw 100 dice. Discard all those that land as a 2 and throw the rest again.

Keep repeating this process, and after several throws, you will have 50 dice left. That number of throws is the half life for the process. If you continue to repeat the dice throwing, eventually you will halve the number again and so on.

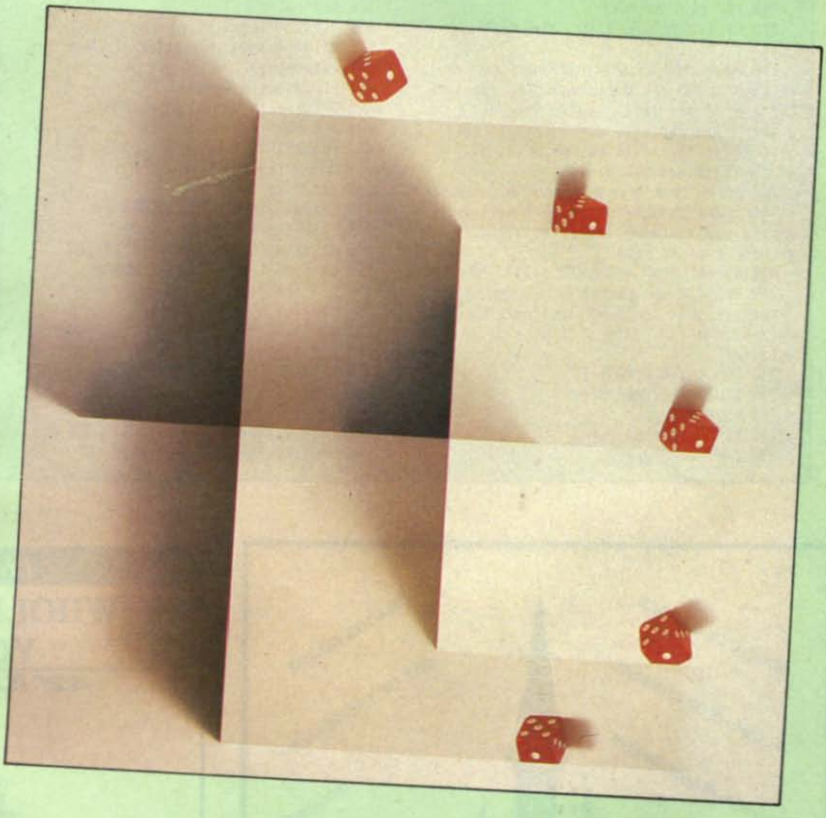
Here the computer is used instead of actual dice. A record is kept of how many dice remain after each throw, and when all the dice have gone – or after 30 throws – a table of the results is shown.

This set of results is used to plot a graph from which the half life is calculated.

By using a computer, the number of possible sides on the dice can be altered. The program allows for dice with between two and nine possible sides. This gives eight different random processes and each will have its own half life.

Half Life is not a program that teaches or helps to revise old knowledge. Its purpose is to allow children – or adults – to investigate a particular process and formulate their own ideas.

A possible aim would be to investigate the relationship between the number of sides on the dice and the half life. This concept is much more in line with the new GCSE emphasis on skills and methods of doing things than on plain memory.

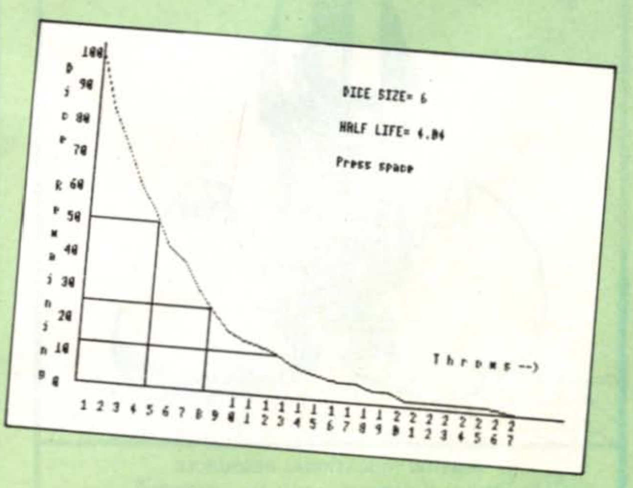


PROCEDURES

decay	Deals with the generating of the random numbers.
graph	Draws the graph of the results and calculates the half life.
init	Sets up variables and arrays.
instruct	Gives instructions and allows dice size to be chosen.
table	Displays the results of all the throws.

VARIABLES

c%	Number of 2s this throw.
d%	Total number of discarded dice.
n%	Number of dice to be thrown.
x%	Number of throws so far.
p%()	Coordination for half life calculation.
s%()	Record of number of dice on each throw.



```
DICE SIZE= 6

HALF LIFE= 4.04

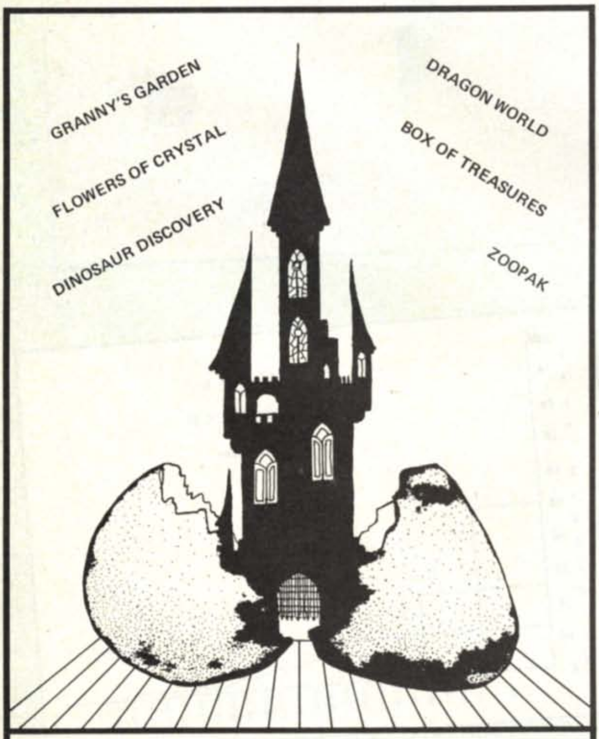
Press space
```

Turn to Page 74 ▶

◀ From Page 73

```
  100 REM Half Life
  110 REM By Rog Frost
  120 REM (C) The Micro User
  130 ON ERROR GOTO 850
  140 MODE6:Z%=RND(-TIME):*FX11
  150 VDU19,0,4;0;
  160 PROCinstruct:PROCinit
  170 PROCdecay:PROCtable
  180 MODE0:PROCgraph:RUN
  190 DEF PROCinstruct
  200 PRINTTAB(15,1)"Half Life"TAB(15,2)
"----------"
  210 PRINT'"100 dice are thrown. Any th
at come up"'"'2' are discarded. The rema
ining dice"'"are thrown again and the '2
s are"'"discarded once more. This is re
peated"'"for thirty throws or until all
of the"'"dice are discarded."
  220 PRINT'"Your dice can have any numb
er of sides"'"between 2 and 9. Please in
dicate now"'"how many sides you would li
ke your dice to have."
  230 REPEATINPUT',hi%:UNTILhi%>1 AND hi%<10
  240 PRINT'"After the throws, a table o
f results"'"will be given, followed by a
 graph."'"The half life will also be cal
culated."
  250 PROCspace(0,VPOS+2)
  260 VDU23;8202;0;0;0;0;
  270 ENDPROC
  280 DEF PROCinit
  290 DIM s%(31),p%(3)
  300 x%=RND(-TIME)x%=0:n%=100:s%(0)=100
  310 d%=0:ENDPROC
  320 DEF PROCdecay
  330 REPEAT CLS:c%=0:x%=x%+1
  340 PRINT'" Throw number ";x%'
  350 FOR a%=1 TO n%:b%=RND(hi%)
  360 IF b%=2 c%=c%+1:SOUND0,-7,5,1:COLO
UR129:COLOUR0
  370 PRINTFNn(b%,1);
  380 COLOUR128:COLOUR1:PRINT" ";
  390 NEXT:d%=d%+c%
  400 s%(x%)=100-d%:n%=n%-c%
  410 PRINT''"Number discarded= ";c%''"N
umber remaining= ";n%
  420 PROCspace(0,VPOS+4)
  430 UNTIL n%=0 OR x%=30:ENDPROC
  440 DEF PROCtable:CLS:PRINT'''
  450 PRINTTAB(5)"Throws"TAB(13)"Dice"TA
B(22)"Throws"TAB(30)"Dice"
  460 FOR Z%=0 TO x%
  470 X%=Z%DIV16*17+7:Y%=Z%MOD16+5
  480 PRINTTAB(X%,Y%)FNn(Z%,2);
  490 PRINTTAB(X%+7,Y%)FNn(s%(Z%),3)
  500 NEXT:PROCspace(1,22):ENDPROC
  510 DEF PROCgraph
  520 VDU19,0,6;0;19,1,4;0;
  530 VDU23;8202;0;0;0;0;
  540 VDU28,1,31,1,2
  550 PRINT"D i c e   R e m a i n i n g"
  560 VDU26,29,100;100;
  570 PRINTTAB(56,24)"T h r o w s -->"
  580 MOVE 0,1000:DRAW 0,0:DRAW 1100,0
  590 VDU5:FOR N%=0 TO 100 STEP 10
  600 MOVE-50,N%*9+6:PRINT;N%:NEXT:VDU4
  610 s%=1000/x%:MOVE 0,900:D%=0
  620 FOR N%=s% TO 1000 STEP s%
  630 D%=D%+↑:D$=FNn(D%,2)
  640 DRAW N%,s%(D%)*9:VDU5
  650 MOVE N%-20,-10:PRINTLEFT$(D$,1)
  660 MOVE N%-20,-50:PRINTRIGHT$(D$,1)
  670 VDU4:MOVE N%,s%(D%)*9:NEXT
  680 p%(1)=FNp(112)
  690 p%(2)=FNp(225)
  700 p%(3)=FNp(450)
  710 hlife=(p%(1)/3+p%(2)/2+p%(3))/3/s%
  720 PRINTTAB(40,2)"Dice Size= ";hi%
  730 @%=&02020A
  740 PRINTTAB(40,5)"Half Life= ";hlife
  750 @%=0:PROCspace(40,8):ENDPROC
  760 DEF FNn(N%,F%)=RIGHT$("   "+STR$N%,F%)
  770 DEF FNp(Y%)
  780 LOCAL X%:MOVE 0,Y%
  790 REPEAT X%=X%+2:DRAW X%,Y%
  800 UNTIL POINT(X%+2,Y%)=1
  810 DRAW X%,0:=X%
  820 DEF PROCspace(X%,Y%):*FX15
  830 PRINTTAB(X%,Y%)"Press space"
  840 REPEATUNTILGET=32:ENDPROC
  850 MODE6:REPORT
  860 PRINT" at line ";ERL:*FX12
  870 @%=10:END
```

This listing is included in this month's cassette tape offer. See order form on Page 159.



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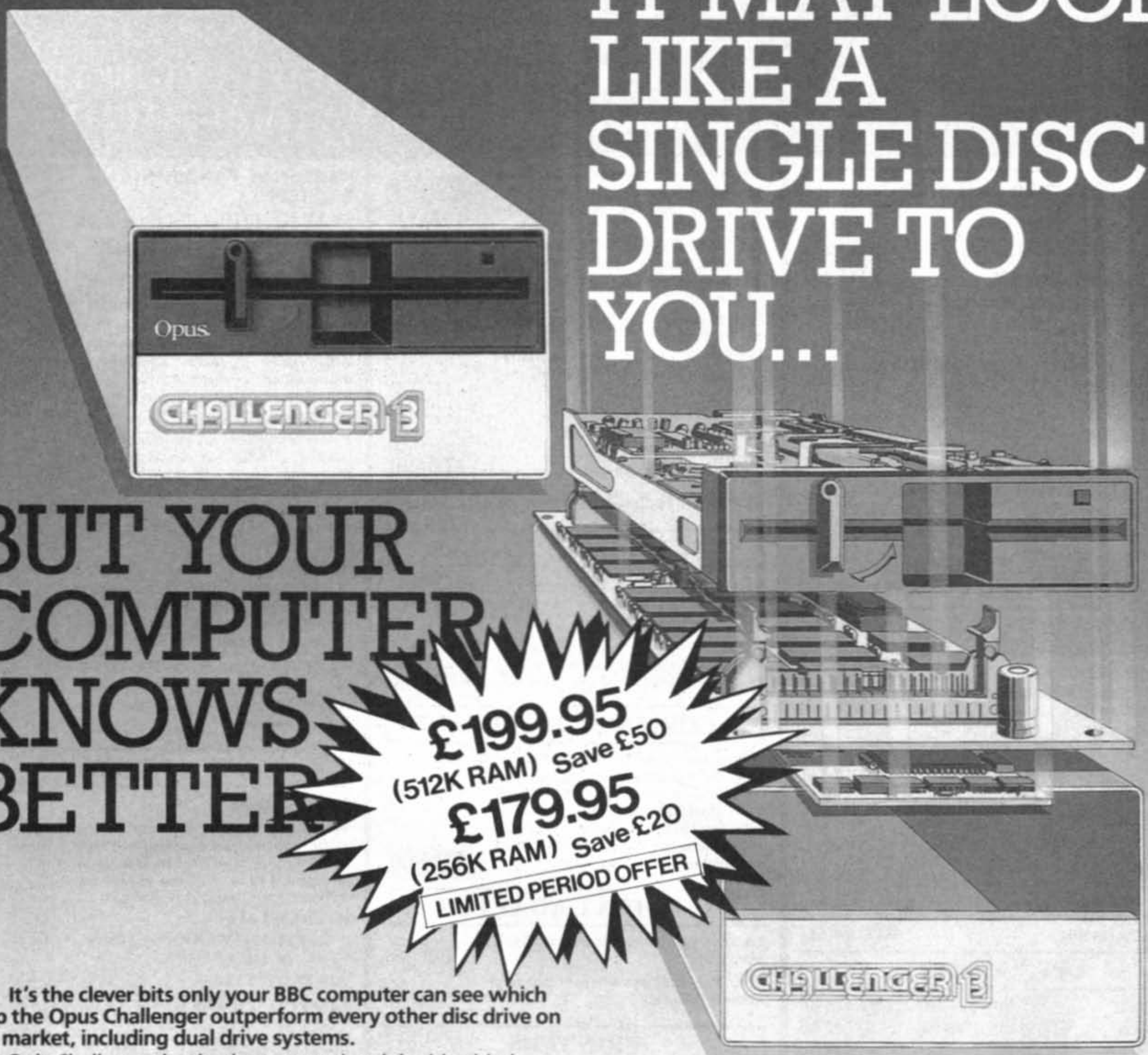

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TRC1 Two rom cartridge	£7.95 (d)
TRC4 Four rom cartridge	£9.95 (d)
TRC 32K Cartridge ind RAM.	£26.95 (d)

BBC MASTER COMPACT

A free packet of ten 3.5" DS Discs with each COMPACT" See page 5 for details

SYSTEM 1 128K, Single 640K Drive & bundled software.	£385 (a)
SYSTEM 2 System 1 with a 12" Hi Res Monochrome Monitor.	£469 (a)
SYSTEM 3 System 1 with a 14" Med Res RGB Monitor.	£599 (a)
Second Drive Kit.	£99 (c)
Serial Kit.	£29 (d)
T.V. Modulator	£29 (d)
Extension cable for external 5.25" 80T Drive (Serial Kit).	£12.50 (d)

UPGRADE KITS

1.2 OS ROM	£15 (d)	ADFS ROM	£26 (d)
DNFS ROM	£17.50 (d)	1770 DFS Kit	£43.50 (d)
BASIC II ROM	£22.50 (d)	Econet Kit	£55 (d)

ECONET ACCESSORIES

Econet Starter Kit	£85 (b)	Econet Bridge	£174 (b)
Econet Socket Set	£29 (c)	Printer Server Rom	£41 (d)
File Server Level II	£75 (b)	10 Station Lead Set	£26 (d)
Master FS Utility Disc	£17.25 (d)		

32016 CO PROCESSOR

For full specification see page 5 £999 (a)

CAMBRIDGE W/STATION

For full specification see page 5 £3,450 (a)

PANOS/PANDORA Upgrade incl 32000 BASIC FP.	£29 (d)
Co-Processor upgrade to 10 MHz operation for faster processing.	£POA (d)
Time Warp Real Time Clock with utilities for reading time and date in PANOS (for model B and B+ users).	£39 (c)
32016 Instruction Set Manual.	£25 (c)

WINCHESTER DRIVES

Acorn 30 Mbyte Winchester with File Server Level III and ADFS hierarchical filing System.	£1,529 (a)
P20HD TECHNOMATIC 20 Mbyte Winchester Drive fully compatible with Acorn ADFS and FS III. Includes ADFS Rom. Special reduced price.	£499 (a)
P204HP TECHNOMATIC 20 Mbyte Winchester and a 80T DS floppy Drive built in a monitor stand. Includes ADFS Rom.	£849 (a)
P2041HT As P204HP but also with a 10 Mbyte tape streamer backup unit and backup utilities. Includes ADFS Rom.	£1,499 (a)
TS10 10 Mbyte Tape Streamer Backup unit with utilities.	£695 (a)
TFC10 10 Mbyte Pre-formatted Cartridge for use with P2041HT and TS10.	£19 (d)
WINCHESTER Drive Multiplexer TWM2 for two computers. TWM4 for four Computers.	 £99 (b) £159 (b)

Details on Technomatic Winchesters on page 6

SECOND PROCESSORS

ACORN 6502 2nd Processor	£173 (b)
TORCH ZEP100	£229 (a)
MULTIFORM Z80 TECHNOMATICs multi format Z80 system includes a FREE Pocket Wordstar + MS/DOS Read/Write Utility	£289 (b)

ACORN IEEE INTERFACE

Allows BBC computer to control any scientific and technical equipment that conforms to the IEEE488 standard. The interface can link upto 14 compatible devices. Typical applications are in experimental work in academic and industrial labs. £265 (a)

TELETEXT ADAPTOR

Converts your computer into a teletext receiver.	£95 (b)
BBC Publications rom for enhanced Teletext Utilities.	£7.95 (d)

PRINTERS

EPSON LX86 120 cps, variety of fonts, including NLQ, bit image graphics, IBM char/graphics compatible, centronics interface standard.	£199 (a)
EPSON LX80/86 Tractor Feed	£20 (c)
EPSON LX80/86 Sheet Feeder	£49 (c)
EPSON FX800 An enhanced version of FX85. Call for details.	£319 (a)
EPSON FX1000 An enhanced version of FX105. Call for details.	£449 (a)
EPSON EX800 See details on page 5.	£409 (a)
Colour option for EX800/EX1000.	£55 (b)
EPSON LQ800 See details on page 5.	£439 (a)
EPSON LQ1000 As LQ800 but wider carriage for 136 columns.	£589 (a)
TAXAN KP815 Enhanced KP810 with 160cps and full IBM compatibility.	£249 (a)
TAXAN KP915 Enhanced KP910 with 180cps and full IBM compatibility.	£369 (a)
NATIONAL PANASONIC KX P1080	£149 (a)
STAR NL 10 (Parallel Interface)	£239 (a)
STAR NL 10 (Serial Interface)	£279 (a)
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INTEGREX Multicolour Inkjet printer.	£549 (a)
Ideally suited for high res colour VDU screen dumps. Quiteness & consistent output are major characteristics.	£525 (a)
BBC Screen dump for Integrex.	£15 (d)
BROTHER HR20 A new attractively styled printer from Brother with unusually quiet operation, host of new fatures, including option to copy current documents. 8K buffer standard expandable to 16K. Parallel & Serial ports as standard.	£329 (a)
STAR POWER Type A new low cost daisy wheel printer incorporating STAR technology for innovation and enhancements. Phone for details. See page 5 for details.	£229 (a)
JUKI 6100 Daisy wheel printer 15 cps, 2K buffer, switchable 10/12/15 cpi proportional spacing, underlining. Parallel interface.	£259 (a)

PLOTTERS

EPSON HI 80 This highly popular A4 four colour plotter which offers precision and high speed plotting is offered at a never to be repeated price. A choice of pens for different applications is available.	£249 (a)
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LINEAR GRAPHICS	
A4S PLOTMATE	£370 (a)
A4SM PLOTMATE	£450 (a)
A3M PLOTMATE	£569 (a)
Parallel Printer Lead (1.2m).	£6 (d)
Serial Printer Lead (1.2m).	£7 (d)

PRINTER SHARERS & BUFFERS

BUFFALO PB Buffer
Parallel buffer for internal fitting to most Epson printers. Simple to instal.
PB128 (128K) £99 (c)

PERIPHERAL & COMPUTER SHARERS
High quality switches to allow the user to switch between computers, printers, modems etc. Fully shielded metal cases. all lines fully switched.

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BBC Cable set 3 to 1 (1m ea)		£32 (d)		£34(c)
BBC Cable set 4 to 1 (1m ea)		£39 (d)		£41(c)

BBC Computer Sharer: TCS26
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DISC DRIVES

Full details on page 6.
All drives fitted with MITSUBISHI mechanisms.

5.25" Single Drives 40/80 switchable:	
TS400 400K/640K	**£114 (b)**
PS400 400K/640K with integral mains power supply	**£129 (b)**
5.25" Dual Drives 40/80 switchable:	
TD800 800K/128OK	**£199 (a)**
PD800 800K/1280K with integral mains power supply	**£229 (a)**
PD800P 800K/1280K with integral mainspower supply and monitor stand	**£249 (a)**
3.5" 80T DS Drives:	
TS351 single 400K/640K	**£99 (b)**
PS351 single 400K/640K with integral mains power supply	**£119 (b)**
TD352 Dual 800K/1280K	**£170 (b)**
PD352 Dual 800K/1280K with integral mains power supply	**£187 (b)**
PD853 Combo Dual 5.25"/3.5" drive with psu.	**£229 (a)**

DISC DRIVE MULTIPLEXER

Full specification on page 6.

TDM2 Dual Unit: 2 computers/one drive unit	**£75 (b)**
TDM4 Quad Unit: 4 computers/one drive unit	**£135 (b)**

3M FLOPPY DISCS

5.25" Discs in packs of 10	
744 40T SS DD	**£10.00 (d)**
745 40T DS DD	**£12.00 (d)**
746 80T SS DD	**£14.50 (d)**
747 80T DS DD	**£15.50 (d)**

See page 10 for details of Special Offer

(Add £1 for library case packing)

3.5" Discs in packs of 10	
80T SS DD	**£20 (d)**
80T DS DD	**£25 (d)**

BULK DISCS

High quality unlabelled discs supplied in packs of 50 in a storage box. The 5.25" discs have the reinforcing hub rings. These discs are guaranteed for life.

50 5.25" 40 T single sided discs in lockable box.	**£35 (b)**
50 5.25" 80T double sided discs in lockable box.	**£45 (b)**
50 3.5" 80T double sided discs in lockable box.	**£95 (b)**

FLOPPICLENE DRIVE HEAD CLEANING KIT

5.25" Kit with 20 disposable discs	**£12.50 (d)**
3.5" Kit with 20 disposable discs	**£14.00 (d)**

DISC STORAGE BOXES

DB340 Lockable 40 x 3.5"	**£8.50 (c)**
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DB570 Lockable 70 x 5.25"	**£11.00 (c)**
DB5100 Lockable 100 x 5.25"	**£13.00 (c)**

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BBC lead incl with all monitors

MICROVITEC 14" RGB Monitors
Please specify plastic or metal case.

Microvitec 1431 Standard Resolution 453 pixels	**£179 (a)**
Microvitec 1431AP As 1431 + composite video and sound input	**£199 (a)**
Microvitec 1451 Medium Resolution 653 pixels	**£225 (a)**
Microvitec 1451AP As 1451 + composite video and sound input	**£259 (a)**
Microvitec 1441 High Resolution 895 pixels	**£365 (a)**

Microvitec 20" RGB/PAL/ Audio Monitors

Microvitec 2030CS Standard Resolution RGB/Comp Video	**£380 (a)**
Microvitec 2040CS High Resolution RGB/Comp Video	**£685 (a)**
TOUCHTEC-501 Brings genuine touch screen operation on metal cased Microvitec monitors, incl utilities disc with starter and development programs	**£239 (b)**
PHILIPS 8501 See page 10 for details.	**£139 (a)**
TAXAN SUPER VISION II 12" Hi Res/Hi Contrast Option to switch to green/amber BBC/IBM Compatible	**£279 (a)**
TAXAN SUPER VISION III 12" Super Hi Res and contrast RGB Monitor with option to switch to mono BBC/IBM compatible.	**£319 (a)**
MITSUBISHI XC1404 14" Med Res RGB Monitor Etched dark screen brilliance and contrast control, BBC/IBM compatible	**£219 (a)**

12" MONOCHROME MONITORS

TAXAN KX1201G Hi Res green etched screen	**£90 (a)**
TAXAN KX1202G Hi Res Long Persistence (P39)	**£95 (a)**
TAXAN KX1203A Hi Res amber etched screen	**£95 (a)**
PHILIPS BM 7502 Hi Res green screen	**£75 (a)**
PHILIPS BM7522 Hi Res amber screen	**£79 (a)**

MONITOR ACCESSORIES

Microvitec Swivel Base (14" plastic monitors)	**£20 (c)**
Philips Swivel Base	**£14 (c)**
Monitor Stand Models B & B+	**£10 (c)**
Monitor Stand Master	**£13 (c)**
Double Tier stand Models B, B+ or Master	**£24 (b)**
Taxan RGB Lead	**£5 (d)**
Microvitec Lead	**£3.50 (d)**
Monochrome BNC/Phono Lead	**£3.50 (d)**

EPROMS/RAMS

2764-25	**£2.50 (d)**
27128-25	**£2.75 (d)**
6264LP-15	**£2.80 (d)**

RAM/ROM EXPANSION

ATPL Board for Model B. Simple to instal, no soldering. Allows expansion to 15 Roms + 2 8K Rams	**£37 (c)**
ATPL Battery backup kit	**£16 (d)**
ATPL Board for BBC+ (now in stock).	**£31 (c)**
TIME WARP Real Time Clock. Plugs into the user port, battery back up as standard, includes manual, demo software including a diary/planner application program	**£31 (d)**
Time Warp with PANOS Utilities.	**£39 (d)**

MODEMS

(All modems are BABT approved)
See page 7 for modem specifications

MIRACLE WS2000V21/23 & BELL stds	**£95 (c)**
WS2000 Auto Dial Card	**£27 (d)**
WS2000 Auto Answer Card	**£27 (d)**
WS2000 SK1 Kit	**£5 (d)**
WS2000 DS1 disc	**£10 (d)**
WS2000 Data Cable for BBC	**£6 (d)**
MIRACLE WS4000 V21/23	**£149 (b)**
MIRACLE WS3000 V21/23	**£295 (b)**
MIRACLE WS3000 V22	**£495 (b)**
MIRACLE WS3000 V22 bis	**£650 (b)**
WS3022 1200/1200 fd	**£395 (b)**
WS3024 2400/2400 fd	**£570 (b)**
BBC Data Cable for WS3000/4000	**£7 (d)**

PROGRAMMING ACCESSORIES/SOFTWARE

See page 8 for detailed specification

Compatible with B, B+ and Master

EPROMER II while stocks last.	**£89 (b)**
EPROMER III See page 8 for details.	**Approx £119 (b)**
MPROMER	**£49 (c)**
META ASSEMBLER	**£145 (b)**
PORTAL EPROM EMULATOR 128K	**£185 (b)**
PORTAL EPROM EMULATOR 512K	**£285 (b)**
TEAM Disassembler	**£145 (b)**
EPROM ERASERS **UV1B** 6 eproms, safety cutout	**£47 (b)**
UV1T 6 eproms, timer, safety cutout	**£59 (b)**

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CAD/DRAWING PACKAGES

NOVACAD II (Master only)	£149 (c)
NOVACAD CAD Package for B, B+ MASTER & Compact. (See page 9 for specification)	
Tracker Ball/Mouse Version (TM)	£79 (d)
TM Version plus Tracker Ball	£119 (c)
TM Version plus Mouse	£105 (c)
Plotter Driver Generator	£25 (d)
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MAX	£17.35 (d)
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PAINTPOT	£21 (d)
DATABASE	£21 (d)
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RB2 Tracker Ball with Icon Master (for B, B+ & Master)	£59 (c)
RB2 Tracker Ball with Cursor Control Rom (for Master only)	£59 (c)
RB2 Tracker Ball 'Stand Alone' for use with NOVACAD & other software)	£47 (c)
Cursor Control Rom for Master	£12.50 (d)
MIRRORSOFT FLEET STREET EDITOR incl VAT	£39.50 (d)

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for Acorn, Torch & Multiform Z80 Processors

MICROPRO's Wordstar Professional	£310 (a)
ASHTON TATE's DBASE II	£310 (a)
SUPERCALC II	£195 (a)

Send for details on our full range of CP/M & PC DOS packages for Business, Communications & High Level Languages.

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VIEWSTORE Acorn's database with display in any mode in spreadsheet or user defined card format and powerful sort facilities. Max file size 4Mb	£37 (d)
STARdataBASE A fast machine code, true random access database. Upto 4000 records/file, 69 fields. Fully menu driven, user defined record layout, very fast searches thru keysearch facility. Mailmerging from VIEW and WW.	£49 (d)
MASTERFILE II Highly popular economically priced database. 17 fields per record, file size limited by drive capacity only. (40T or 80T) Please state DFS or ADFS.	£17 (d)

WORD PROCESSORS

VIEW 2.1	£37 (d)
VIEW 3.0	£56 (c)
VIEW INDEX	£12 (d)
VIEW PRINTER DRIVER GENERATOR	£9 (d)
DOT PRINT PLUS Full details on page 5 NLQ rom for Epson FX/RX, MX and GLP.	£28 (d)
WORDWISE	£24 (d)
WORDWISE PLUS	£38 (d)
WYSIWYG PLUS See page 7 for details.	£21 (d)
INTERWORD (If you own a WW+ then quote your reg number and pay £39).	£46 (d)
SPELLMASTER	£49 (d)
WORDEASE A 16K rom based utility for WW+	£24 (d)
SPELLCHECK III A 16K rom based spellcheck program for View and WW. Contains 2000 words on the rom and 6000 (expandable to 17000) words on a disc.	£31 (d)
EDWORD II (Please specify model B, B+, Compact or Master).	£43 (c)

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VIEWSHEET Acorn's spreadsheet provides 255 cols and 255 rows and will operate in any mode. Fully compatible with VIEW and 6502 2nd processor.	£37 (d)
WINDOMATIC Enhances the power of Viewsheet See page 9 for details.	£15 (d)
VIEWPLOT A disc based plotting program. (To be released soon).	£22 (d)
INTERSHEET The new spreadsheet from Computer Concepts with many advanced features like 105 col mode, holding several spreadsheets in memory at a time etc.	£39 (d)
INTERCHART Graphics package for Intersheet	£27 (d)
ULTRACALC BBC Publications very popular and well proven spreadsheet rom includes graphics utility disc.	£52 (d)
QUICKCALC A disc based economically priced spreadsheet package (40 or 80T Disc).	£14.50(d)
MINI OFFICE II (for BBC B) A suite of inexpensive but extensive word processor, database and spreadsheet packages. (40T or 80T)	£14.75(d)
MINI OFFICE II (Rom)	£48 (d)

LANGUAGES

META ASSEMBLER Multi processor Assembler full details on page 8	
TEAM DISASSEMBLER	£145 (b)
MACROM A very fast full featured macro assembler rom from 6502 and 65C02 codes, allows use of macros from library disc. Assembly can be disc to memory, memory to memory, memory to disc and disc to disc thus allowing very long source code upto the length of disc in use. About 3 times as fast as ADE and 30% more economical in memory.	£33 (d)
ACORN MICRO PROLOG Logic programming language used extensively in the artificial intelligence field. A simple 'front end' is supplied to make syntax more friendly.	£62 (d)
ISO-PASCAL Acorn's full implementation of International Std Pascal on 2x16K roms.	£48 (c)
ISO PASCAL STAND ALONE GENERATOR	£30 (d)
OXFORD PASCAL A fast P-code compiler and stand alone utility (40 or 80T).	£36 (d)
BCPL	£46 (c)
BCPL CALCULATIONS Supports floating point, fixed point and fast integer calculations on BCPL	£17.50 (d)
BCPL STAND ALONE GENERATOR	£39 (d)
ACORN LOGO	£46 (c)
LOGOTRON LOGO	£55 (c)
BBC PUBLICATIONS OPEN LOGO	£59 (c)
ACORN LISP ROM	£39 (d)
ACORN FORTH ROM	£39 (d)
ACORN COMAL ROM	£43 (d)
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MICROTEXT PLUS Extended Features incl extra memory, control of external devices etc. Rom based.	£229 (b)

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COMMSTAR A highly popular communication rom suitable for all general purpose applications (specify B or Master)	£28 (d)
COMMUNICATOR A full 80 col VT100 emulation program with easy to follow screen menus.	£49 (d)
DATABEEB A variety of facilities for use with WS2000 Modem	£26 (d)
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MACROM	£37 (d)
BETABASE	£27 (d)

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ACORN BASIC EDITOR	£22 (d)
MONITOR (BBC Pub)	£34 (a)
BROM PLUS	£26.50 (d;
SLEUTH	£23 (d)
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TOOLBOX 2 (BBC Pub) Manual	£9.50 (d)
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A series of programs developed in many cases alongside Radio & TV programmes by BBC's Education Department which supplement the classroom studies by moving and colourful displays helping in clear understanding of a variety of subjects. Some packages also include audio cassettes.

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S.T.: FOOD & POPULATION
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Disc/aud/EC **£16 (c)**
Book **£5.95 (d)**

Cassette based programs listed above can be supplied on disc at an extra charge of £1.50 per disc and please specify the format required 40 or 80T.

PRINTER ACCESSORIES

EPSON ACCESSORIES:

Interfaces:

8143 RS232	£28 (d)
8148 + RS232 + 2K	£57 (d)
8148 + RS232 + 8K	£65 (d)
8165 IEEE + Cable	£65 (d)
8132 Apple II	£60 (d)
8177P NLQ for FX80 + /FX100 +	£99 (d)

Parallel & Serial Buffers of various size also available.

FX80/80 + /85 Tractor Attachment	£27 (c)
LX80/86 Tractor Feed	£20 (d)
LX800 Tractor Feed	£44 (b)
LQ1000 Tractor Feed	£49 (b)
EX800/1000 Colour option	£55 (b)
H180 HP GL Emulation Rom + Ram	£59 (c)
H180 Printer Emulation Rom	£35 (c)

SHEET FEEDERS:

8338 LX80	£49 (b)
8333 FX100 + /105	£169 (a)
8331 FX80 + /85	£129 (b)
8330 RX80 +	£129 (b)
LQ800	£129 (b)
LQ1000	£159 (b)
EX800	£129 (b)
EX 1000	£289 (b)
FX 800	£129 (b)
FX 1000	£169 (b)

Ribbons:

RX/FX100/100 + . FX105	£7 (d)
RX/FX80/80 + , FX85	£4 (d)
LX80	£4.50 (d)
LQ800	£8.50 (d)
LQ1000	£10 (d)
LQ1000	£10 (d)
EX800/1000	£7.50 (d)
H180 Pen Set (Aqueous/Ball point)	£7.50 (d)

Dust Covers:

FX80	£5.50 (d)
TAXAN/Canon KP810	£6 (d)
FX100 **£7.50 (d)** **KP910**	£7 (d)

HITACHI 672 Plotter

Aqueous Pen Set six pens	£18.50 (d)
Oil Based Pen Set six pens	£25.00 (d)

TAXAN CANON Accessories:

RS232 + 2K interface	£63 (d)
Ribbon. KP 810/815/910/915	£6 (d)

Star Printer

NL10 Sheet Feeder	£52 (b)
NL10 RS232 Interface	£69 (c)
NL10 IBM Type Interface	£39 (c)
NL10 Ribbon	£4.50 (d)

National Panasonic KX P1080

Spare Ribbon	£4.50 (d)
Serial Interface	£39 (c)

JUKI 6100

RS232 Interfaces	£65 (d)
Tractor Feed	£149 (a)
Ribbon (Carbon)	£2.00 (d)
Spare Daisy Wheel	£14 (d)
Sheet Feeder	£182 (a)

BROTHER HR20

Daisy Wheel	£18 (d)
Tractor Feed	£116 (a)
Spare Ribbon Nylon	£3.00 (d)
Spare Ribbon Carbon	£4.50 (d)

INTEGREX INK JET COLOUR PRINTER

Spare Ink Cartridge Black	£9 (d)
Spare Ink Cartridge Colour	£15 (d)
Paper Roll	£7 (d)

Printer Leads:

BBC Parallel Lead (1.2m)	£6 (d)
BBC Serial (Epson) Lead (1.2m)	£7 (d)

Other lengths can be supplied on order:

IBM Parallel Lead (2m)	£12 (d)

PAPER & LABELS

Plain Fanfold paper with micro perforations:

2000 sheets 91/2" × 11" 60gms/sq m	£12 (£3)
2000 sheets 141/2" × 11" 60gms/sq m	£18.50 (4.50)
1000 sheets A4 90gms/sq m	£12 (b)

Labels/1000:

Single Row 3½ × 1 7/16"	£5.25 (d)
Triple Row 27/16" × 17/16"	£5 (d)

LEADING SUPPLIER TO BBC MARKET ESTABLISHED OVER 15 YEARS

TECHNOMATIC

BBC COMPUTERS & ECONET CENTRE

17 Burnley Road, London NW10 1ED Tel: 01-208 1177
305 Edgware Road, London W2 Tel: 01-723 0233

ACW443 CAMBRIDGE WORKSTATION

A complete self-contained workstation with:.

- NS32016 8MHz Main Processor & 32081 FP processor.
- 20 Mbyte Winchester and one 80T Ds floppy drive.
- A detachable keyboard Hi Res RGB Monitor.
- 4Mbyte of on board Ram as standard.
- Languages supplied include: Fortran 77, Pascal, C, Cambridge LISP, 32016 Assembler & 32bit BASIC.
- Utilities on the operating system to cross link programs between different languages, utilities for porting programs to mainframes.
- **Phone for detailed leaflet.**

32016 CO-PROCESSOR

A second processor that brings genuine 'Mainframe' power to the BBC Computer.

- Interfaces with the BBC through the tube connector.
- NS32016 6MHz CPU & 32081 FP processor.
- 1Mbyte Ram as standard.
- Packaged software includes all the languages and utilities supplied with the ACW Work Station.
- **Phone for detailed leaflet.**

CPU/FP Upgrade Kit (non-Acorn) for the Co Processor for 10Mhz operation to enable faster processing. It can be fitted at no extra charge if ordered with the Co Processor.

TIME WARP Real Time Clock with PANOS utility allows screen display of time, day and date within PANOS at anytime and allows these data to be printed on documents. Model B users will find this particularly useful.

512 CO-PROCESSOR

Brings professional software to the BBC Master.

- 10 Mhz 80186 *DOS PLUS.
- GEM Write & GEM Draw.
- 'WIMP' Environment with high quality Mouse.
- Runs many 'IBM' programs — even 'Flight Simulator'!
- Convert to/from IBM/BBC data.

DOTPRINT PLUS

A uniquely versatile NLQ ROM for the BBC Micro.

- Built-in character font generator.
- Built-in view printer driver.
- Supports microspacing for professional justification in View & with disc in Wordwise/Plus.
- True bold print as well as double width.
- 12 character pitch as standard.
- Fully variable pitch and line spacing.
- Suitable for fully **'EPSON'** compatible printers with quad-density graphics.
- **DOTPRINT PLUS** for EPSON FX/RX and compatibles.
- **DOTPRINT DUAL** for EPSON MX range.

MICROJUSTIFIED TEXT

homes of a ruling class whose right to
rule was based on the ownership of
land. Large estates produced money;
perhaps even more important, they
supplied people to fight for their

NORMALLY JUSTIFIED TEXT

homes of a ruling class whose right to
rule was based on the ownership of
land. Large estates produced money;
perhaps even more important, they
supplied people to fight for their

Notice how MICROJUSTIFICATION eliminates 'stretched' spaces between words.

THE BBC
MASTER SERIES
MICROCOMPUTER

For price details see page 1.

Compact
BRITISH BROADCASTING CORPORATION
MASTER SERIES MICROCOMPUTER

THE FAMILY COMPUTER

Now available from stock

This low cost high tech computer has developed specially as a computer for home use.

SPECIFICATION

128K RAM, ADFS Filing system, BBC Basic version 4, MASTER style keyboard, a single 640K 3.5″ double sided drive. RGB/Mono Monitor as an optional extra.

Bundled software pack includes:
Desk Top Prog with note pad & calculator, VIEW 3.0, Card Index, & LOGOTRON. A set of exciting games and graphic demos.

Authorised dealer for
"Advanced Interactive Video System"
Please send for details on the equipment and subsidies available to schools

EPSON PRINTERS

EPSON have launched a new series of printers to update the FX range — world's best selling printer range. The new **FX800** and **FX1000** range combines printing versatility and superior technical features with the highest standards of reliability. The features include two NLQ fonts, 10, 12, 17 and 20 cpi, dble ht and dble width, 200 cps in draft and 40 cps NLQ, tractor and friction as standard, IBM compatible, full graphics, 8K buffer, Parallel interface.

EPSON EX800/1000 range offers high speed printing to offer versatility in volume printing with speeds of 300 cps in 12 cpi mode. Four colour printing option is available for these printers.

EPSON LQ800/1000 range with its 24 pin print head offers the highest standards in letter quality printing at high speeds while maintaining the versatility of dot matrix printers. The hex density graphics capability produces about the best printout any dot matrix printer can produce.

STAR NL10

A 80 col 120 cps printer with fine NLQ at 30 cps offers novel and innovative features. There are no dip switches to set, full control from the front console. Plug in interface cartridge simplifies adaptation to different computers. Friction & Tractor feed as standards. Epson Compatible Graphics.

NATIONAL PANASONIC KX P1080

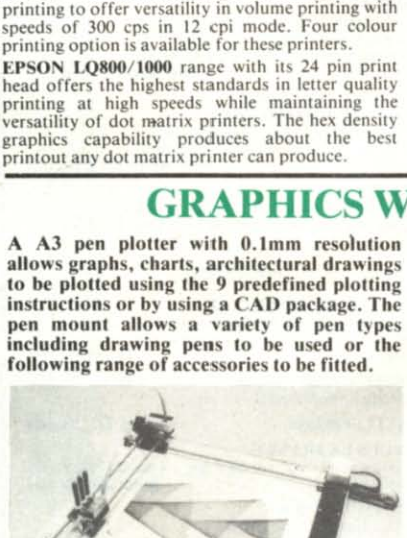
A high performance low cost printer with full character pitch feature 10, 12, 15 & 17 cpi and proportional spacing in both draft and NLQ mode. 80 column, 100 cps draft and 20 cps in NLQ. Parallel interface and Friction and Tractor feeds as standard. Epson Compatible Graphics.

HITACHI 672

- A3 four colour precision plotter.
- Serial and parallel ports as standard.
- Produces 'OHP' transparencies as well as plain paper.
- 'HP' graphics language or single character commands.

GRAPHICS WORKSTATION

A A3 pen plotter with 0.1mm resolution allows graphs, charts, architectural drawings to be plotted using the 9 predefined plotting instructions or by using a CAD package. The pen mount allows a variety of pen types including drawing pens to be used or the following range of accessories to be fitted.



OPTICAL SENSOR

This converts the plotter into a input device and offers a new range of applications: Scan or digitise a picture or a drawing to display or store. Traverse mazes and investigate methods of artificial intelligence. Reliably read bar codes.

DRILL/ROUTER

This will drill holes, machine moulds and cut complex 3-D shapes in a range of suitable materials to a depth of 16mm. Driver software is supplied on disc and an optional application program is available to interface the drill/router to our NOVACAD package.

SCRIBER

The sharp pointed scriber may be used to etch fine line drawings on surfaces such as scraperboard, wax coated copper etc. Full details on request. See page 1 for price.

All accessories available separately if required.

TECHNOLINE
(24 hr viewdata system)
Tel: 01-450 9764

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Telex: 922800

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(near Edgware Road ⊖)

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Prices are subject
to change without notice.

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(b) £2.50
(c) £1.50
(d) £1.00

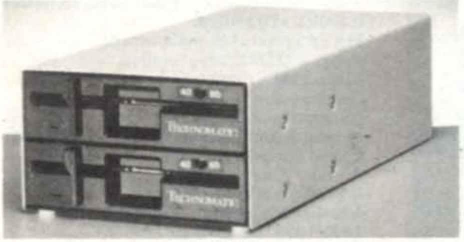
DISC DRIVES

TECHNOMATIC offers a wide range of high quality, high performance drives to meet all needs of BBC micro users. Please see our detailed and competitive price list on page 2.

TS 400

*All drives are fitted with high quality slim line ultra low power Mitsubishi mechanisms capable of single and double density operation and offering very fast track access and head settling times.

*5.25" floppy drives are fitted with 40/80 track switches as standard at no extra cost. The switches are located in the front and clearly marked to indicate the status at a glance.



PD 800

*The mechanisms are set inside attractively styled, sturdy metal casings painted in BBC beige colour.

*The plinth version drives provide for a neat and compact system installation giving it a more professional look.

*All drives fitted with all necessary leads and are ready for operation on unpacking. The drives with the mains power supply are supplied with a mains lead fitted with suitably fused 13A moulded plug.

PD 800 P

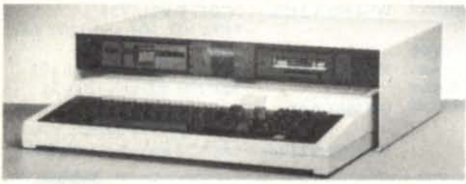
*PD853 Combo drive includes a combination of 5¼" (40/80T switchable) and a 3½" 80 Track Double Sided mechanisms. Complete with mains p.s.u. Ideal for software conversion for 5¼" to 3½" or vice versa.

Such is our faith in Mitsubishi mechanisms that we offer a two year warranty on our floppy drives

WINCHESTER DRIVES

Mass storage 20 Mbyte drives are available in the following versions:

- P20HD Stand alone.
- P204HP With a single floppy housed in a plinth version case.
- P214TS Top of the range with a 10 Mbyte back up streamer and a single floppy housed in a plinth type casing and supplied with backup utilities.
- TS10 A stand alone 10Mbyte streamer for those who are already equipped with a Winchester and a floppy drive. Utilities for backup can only be loaded from a floppy.



P2041 HT

All models are fully compatible with Acorn's ADFS system and include a mains psu and the necessary cable connections.

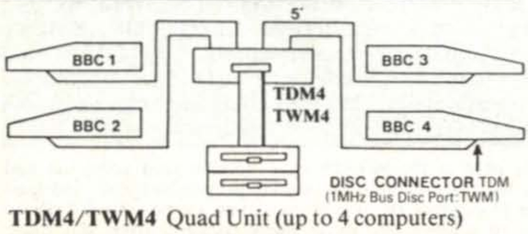
ALL TECHNOMATIC DRIVES NOW CARRY A TWO YEAR WARRANTY

FLOPPICLENE
Disc Drive Cleaning Kit

Floppiclene introduces a positive concept in ensuring continuous high performance of the disc drives by providing an easy and efficient method of keeping the drive heads clean. Use of disposable cleaning discs eliminates the risk always present in reuseable discs of recontamination and abrasion of the sensitive drive heads. Available for both 5.25" and 3.5" drives. Please see page 2 for prices.

DISC DRIVE MULTIPLEXER

The cost-effective alternative to networking! A self-contained unit that enables up to four computers to be connected to one single or dual disc drive. No hardware modifications — simply plugs into the computers disc interface connectors. No ROMs or other software needed. All DFS commands work as normal. The switching of drives between computers is totally automatic and completely invisible to the user. This unit is ideal for installing in classrooms and other situations, where networking is not planned or necessary, or where costs must be kept low. In many cases software needs to be shared, although full networking complexity and cost is not needed. Several of these units can be connected in series to allow more computers to access the same discs, i.e. two quads connected together will allow 7 computers to share 1 drive. Units are supplied with 5' of cable per outlet as standard. Mains powered.



TDM4/TWM4 Quad Unit (up to 4 computers)
TDM2/TWM2 Dual Unit (2 computers)

WINCHESTER DRIVE MULTIPLEXER

A unique addition to our hardware range that allows the sharing of a Winchester between a number of computers. The principle of operation is the same as our highly popular disc drive multiplexers and there is no need for any additional software or hardware modifications. The Multiplexers are available in two versions, a dual unit for two computers and a quad unit for four computers to share a Winchester. Multiplexers are particularly useful for accessing common software and transferring data between the computers. (Not recommended for use with randon access files).

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MODEMS

MIRACLE WS4000

- A cost effective intelligent modem that offers the best value for money bringing the world of data communication within easy reach.
- Plain English commands make it simple to use, even for the first time user.
- Latest Hayes-type protocol commands, auto dial, auto answer, auto speed seeking.
- Equalisation model in V23 for line-noise filtering.
- Many other options including upgrading to V22 and V22 bis.

MIRACLE WS2000

- A comprehensive manually switched 'World Standard' modem.
- Competitively price with a capability to be upgraded for various options.
- BT approved for V21/V23, 300/300, 1200/75 and 1200/1200 half duplex.
- Includes BEL103/113/108 standards for use outside UK.

Optional extras include (Not BT approved).

- SK1 chip set for computer control.
- User port cable.
- Auto dial Board.
- Auto Answer Board.
- DS1 disc for auto dial facilities on Commstar.

APPROVED for connection to telecommunication systems specified in the instructions for use subject to the conditions set out in them
MODEM
MODEM V22
MODEM

WS 3000 Range

Miracle have introduced two new models in the WS3000 series for users who require a modem for a specific use. Model WS3022 provides 1200/1200 baud full duplex operation whilst only WS3024 provides 2400/2400 baud fd only.

Please see page 2 for prices

MIRACLE WS3000 RANGE

- A professional range of intelligent modems with full BABT approval.
- Auto Answer and Auto Dial facilities installed as standard.
- HAYES protocols implemented.
- Pulse or DTMF 'tone' dialing.
- Plain English command structure simplifies the use of the modem.
- Integral parallel printer port fitted as standard configurable for both input and output for process control applications.
- A line sharing facility to differential between data and voice calls.
- Intelligent speed buffering converts 1200/1200 terminals to 1200/75
- Equalisation mode for line noise filtering.
- Internal battery back up for storing 63 names, numbers and default settings.
- Upgrade path for 1200/1200 and 2400/2400 and security encryption.
- Applications in the field of graphics and text access, high speed telex, user to user, and user to main frame.

SPECIFICATIONS

WS4000 V2123:	*CCITT V21/V23. *300/300, 600 and 1200 half duplex, 1200/75.
WS3000 V2123:	*CCITT V21/V23/Bell 103. 300/300, 600 and 1200/75
WS3000 V22:	*As V2123 and also 1200/1200 full duplex.
WS3000 V22 bis:	*As V22 and also 2400/2400.

MULTIFORM Z80

A unique Z80 2nd Processor with a 'MULTI FORMAT' capability.

includes a FREE Pocket Wordstar package

- Multiform Z80 will run most CP/M 2.2 formats on the BBC.
- 28 different formats including Acorn Z80, RML 380Z & 480Z, EPSON QX, Amstrad, Osborne etc, supplied on the library disc with the utility to create additional formats.
- Emulates the two of the most commonly used CP/M terminals, HAZELTINE 1500 and ADM-3a in addition to the Acorn VDU making installation of most of the software packages easy.
- Utility to inter convert ASCII text wordprocessed on a standard BBC and under OS/M or CP/M .
- 8271 allows single density CP/M formats whilst 1770 DFS allows both single and double density CP/M formats. Single or dual drive, 40 or 80 track format and SS or DS drives can be used providing the CP/M format matches.
- Dual drive will allow two separate formats to operate simultaneously for data transfer making it ideal for use in environment where machines with different formats are in use.
- Utility to read and write on IBM PC DOS discs available as an optional extra. Utility will also format a PC DOS disc.
- Multiform Z80 is supplied with a OS/M operating system rom, System disc and a Library disc. Please specify the DFS type and the drive format when ordering.

WYSIWYG PLUS

NEW

This new screen/printer utility not only allows you to see on the screen exactly how the text is going to appear on the paper when printed but also simplifies the printer control codes that you need to use to get the different effects.

WYSIWYG + can be used in BASIC or from within most popular word processors like View, Interword & Wordwise Plus.

The printer commands have been simplified to meaningful words so that the user does not have to either remember or keep referring to the printer manual and try to decode the commands to VDU format. For example: *ENGLARGED will display enlarged text on the screen and send the appropriate command to the printer to print in enlarged mode.

Some of the features you could see in WW + or from BASIC include:
*SUBSCRIPT, *SUPERSCRIPT, *ENLARGED, *BOLD, *EMPHASISED, *CONDENSED (up to 132 characters on screen), *PICA, *ELITE, *GRAPHICS (design your own logos and symbols), *UK, *FRENCH, *US, *TELETEXT (character sets), *BACKSPACE (for overprinting), *DOWNLOAD (new characters or fonts).

Simply plug in the WYSIWYG+ rom in your computer and utilise the features built in to your printer with ease and least bother to produce the results you know are possible but not so simple to achieve. No other single package offers this much flexibility and simplicity to get the best from your printer.

WYSIWYG+ rom is supplied with a comprehensive manual.

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(24 hr viewdata system)
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(c) £1.50
(d) £1.00

EPROMER III
Eprom Programmer

An enhanced version of the highly successful EPROMER II providing added sophistication to the eprom programming applications on the BBC computer range. The new software also utilises the extra facilities of the BBC Master computer. The programming methods are 'state of the art' of programming technology for fast, efficient and cost effective operation.

The single rail eproms handled by the EPROMER III are:

- 2716 2732 2764 27128 27256 27512 27513 27011 2516 2532 2564 (NMOS & CMOS)
- One time eproms P27XXX, 87CXXX etc.
- Also A suffix eproms such as 27XXXA

The software is menu driven, many operations being single key. On screen help clarifying the operation being carried out. Will make the programming process very simple and easy for both specialists and novices alike.

The main features of the programming software are:

* Device, function and voltage selection from the computer keyboard.
* Continuous display of the options selected.
* All eproms upto 27512 (64K) programmed in single pass.
* Automatic Intelligent identifier support for eproms able to respond.
* Selectable programming voltage 25/21/12.5V
* 3 programming methods: Normal, Intelligent & Pulse (20 sec for a 27128).
* Serial port protocols supported.
* Intel HEX, Motorola S, HEX and ASCII protocols supported.
* DFS, NFS, ADFS and Rom Filing System Supported.
* BASIC/Machine Code programming using RFS.
* Powerful editor with input in HEX or ASCII. * Full editable 64K file.
* Block move of data within the address range.
* User can select any section of the eprom from single byte to the full address range to blank check/burn/verify. Facility to program single bytes makes program development/amendment simpler.
* Multiple loading for ROM Filing System

Some of the above features apply to Master Computers only

EPROMER III interfaces with the BBC through the 1 MHz bus, has a mains power supply and is fitted with a 3M TEXTOOL ZIF socket to provide consistent and reliable service for a long period.

META Version III

"All the good features you would expect to find in a good source code editor are present . . . Meta assembler lives in a different world. It is structured to work with any new processor . . . as new instruction sets can be added . . . as needed . . . has a well featured editor with colour highlighting, a sound modular approach." **Acorn User October 1986**

- Assembles for over 30 popular processors, including Z80, 6800/01/02/04/05/09/11 etc — and 68000 — using native mnemonics for each processor, eg. LD A, (HL) for Z80 and MOV AO, $1000 for 68000 etc.
- Fully integrated Editor: four field, all search, search/replace, block copy, delete, move, marked save, load etc.
- Compatible with Portal Eprom Emulators and Team Disassemblers.
- Send object code in Intel Hex, S-Record, straight binary etc. down to discs, RS232, parallel port, Eprom Emulators etc — all **during Assembly.**
- Over 50 directives included as standard: handling nestable macros, conditional assembly and twenty types of table definition directives.
- 32 bit labels; 31 character names. Arithmetic and Boolean arithmetic to 32 bits.
- Modular source code with numeric and string parameter passing.
- Serial communicator area with eight options lines: echo, control code trap, LF supression/addition etc.
- Over 500 in use throughout the world in universities and many different industries.
- Two 16K Roms, two 80 track discs, A4 ring-band manual, function-key strip.

PORTAL EPROM EMULATORS

- Emulates 2716, 2732, 2764, 27128, 27256, 27512 eproms at 150ns Access time.
- Load at 4Kbytes/second — No "erase" time.
- 28 pin header plugs into Eprom socket on target system — status monitored on 13 Leds.
- Fully software controlled from Meta Assembler.
- 100 times faster than standard EPROM program/erase cycle.
- Fully CMOS compatible; draws no power from target system.
- Four portals may be independently programmed off same user-post cable.
- Complete with all cables, manual and disc.

PORTAL 128 (2716, 2732, 2764, 27128):
PORTAL 512 (2716, 2732, 2764, 27128, 27256, 27512).

MICROPROMER

An add on unit for Epromer II enabling the user to program 8741, 8748 and 8749 single chip microcontrollers. Now with the aid of cross assemblers such as META, the user can write code for the above devices and then with the aid of Micropromer program the device.

* Simple menu structure with on screen help. i.e. select a function and on the screen will appear details of the function being performed.
* Comprehensive error reporting and checking.
* Read, verify, blank check, program from 1 to the maximum byte count for the device being used at any address location.
* Support for DFS, ADFS and cassette filing systems.
* Edit data in Hex or ASCII.
* Total control via software, no switches to worry about.
* Supplied with user manual and software on diskette.
* MPROMER simply plugs into the EPROMER II ZIF socket.

TEAM DISSASSEMBLER

The third part of the Universal Development System: a Meta labelling dissassembler.

Supports 1802, 8080, 8085, HD64180, Z80, 65XX (includes 65 col, 6511 etc), 68XX (includes 00, 01, 02, 03, 08 etc): updates soon for most of Meta processors.

- Up to 64K of object code translated back into META compatible source code modules: labels automatically inserted on all jump targets, memory references etc.
- Pre-editing stage allows marking of object code areas as byte, string, word, long word etc, tables. These areas dis-assembled into appropriate directives instead of garbage mnemonics.
- Reconstituted source code ready for immediate re-assembly by META.
- Omniversal search/replace for re-naming arbitary label names with meaningful ones.

BOOKS

No VAT Carriage Code (c)

LANGUAGES

6502 Assy Lang Prog	£19.95
6502 Programming	£13.95
8086 Book	£23.95
Acorn BCPL User Guide	£15.00
Acorn FORTH	£7.50
Acorn LISP	£7.50
Acorn ISO Pascal Ref Manual	£10.00
Intro to COMAL	£10.00
Intro to LOGO	£7.50
Micro Prolog Ref Manual	£10.00
Introduction to Turbo Pascal	£14.95
Prog the Micro with Pascal	£8.50
The UNIX Book	£7.50
Unix User Guide	£19.95
Understanding Unix	£18.45

BBC MICRO GUIDE BOOKS

BBC User Guide Acorn	£15.00
BBC Plus User Guide	£15.00
Drawing your Own BBC Programs	£6.95
Inside Information	£8.95
Math Prog in BBC Basic	£7.95
Toolbox 2	£10.95
VIA 6522 Book	£4.50

PROGRAMMING/UTILITY

Advanced Sidewise Ram User Guide	£9.95
Advanced User Guide (BBC)	£15.95
Advanced User Guide	£12.50
Applied Ass./Lang on the BBC	£9.95
BBC Micro Sideways ROM's RAM's	£9.95
Guide to the BBC ROM	£9.95
Beginners Guide to W.P	£7.95
View 3.0 User Guide	£10.00
Viewstore	£10.00
Viewsheet	£10.00
Wordwise Plus	£9.95

SOUND & GRAPHICS:

Mastering Music	£6.95

DISC DRIVE SYSTEMS:

Advanced Disc User Guide	£16.95
Disc Book	£3.50
Disc Programming Techniques	£7.95
Disc Systems	£6.95
File Handling on the BBC	£6.95
Discovering Disc Drives	£POA

APPLICATIONS:

Interfacing Proj for BBC	£6.95
BBC and Small Business	£5.75

PROFESSIONAL SOFTWARE

Wordstar made easy	£16.95
Introduction to Wordstar	£17.95
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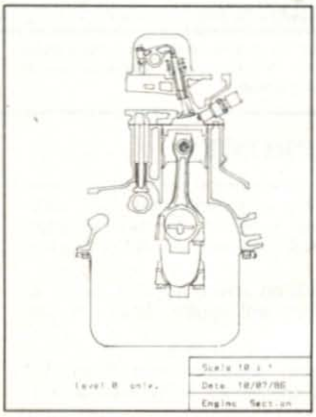

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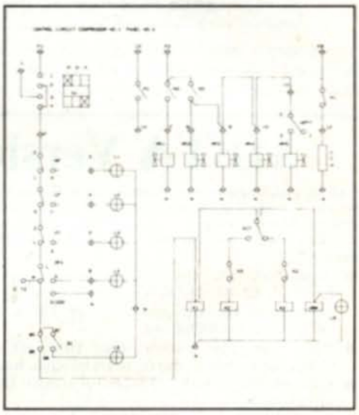

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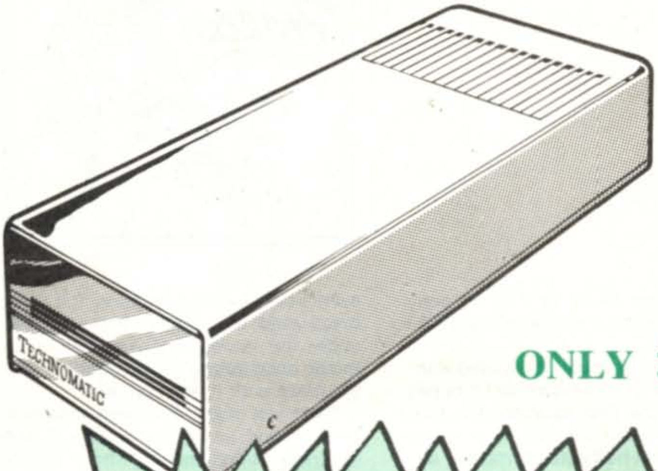

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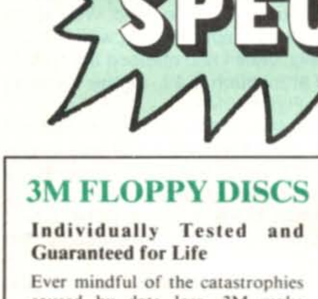

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Twisty maze mapping in action

by
The Mad Hatter
10/6

TO begin on a personal note, people have been asking if I am a sir or a madam, and what do I do when I am not locked in mortal combat with adventure games.

Well, I am a clerical worker, my two sons call me Dad, and I am of a shy and retiring disposition. But that's enough of my problems – let's start on yours.

There's a classic to be found in Robico's Enthar Seven – the forest maze. Located in area 3, it is a clever variant of the twisty little maze beloved of those who like to uprate my blood pressure.

Before you look at a detailed map of the maze (Figure 1) I want to comment on the mapping technique.

Enthar Seven is a multi-sectioned game, so I vary my mapping system slightly. It clarifies procedures and also keeps the map from becoming too cumbersome.

It involves numbering the locations differently. I numbered those in the Space Hopper a1 to a6, and those in the Command Centre 1 to 25.

When it came to the seven planetary areas I added a prefix showing which button had been pushed. Thus area 4 had numbers from 4.01 to 4.42, area 5 started at 5.01, and so on for each.

The moment I realised that the forest was a maze needing to be mapped by the "drop an object" technique, I went back to my saved position in the Command Centre where all the objects I had acquired were stored.

Incidentally, when I update this sort of save (unlike the temporary kind where I just think there is potential trouble ahead) I don't wipe any previous ones. Instead I include a prefix number in the file label every time I save so that I build up a set of saved positions.

The reason is simple. If at some future point in the game I find that I need to backtrack a little, I then have a series of saved positions at the Command Centre after completing each section. It means I should not be utterly humiliated by having to start again from scratch.

Anyway, back at the Command Centre I picked up as much as I could carry (wearing everything wearable) then off I went.

Random moves must be avoided when mapping this type of maze, so I dropped the coin at the first location and then went North. Because the coin disappeared I knew I had actually moved, so I dropped the pliers.

I next moved South hoping I would emerge at the coin location – but no, the pliers stayed visible, so I entered the comment "Same" indicating no move had been made.

I then entered N (a real move), dropped the flower, found that S took me back to the pliers, went back to the flower and moved N again.

Gradually the pattern of the maze emerged, and it became the simple but tedious matter of covering all eight lateral directions for every location discovered.

You should now be able to follow my progress from the map. Note, too, that even when I found location 3.11 and discovered the Flipper Plate (hidden under the leaves that are part of the forest description) I continued to map the maze until it was complete.

There just might have been something else to find under the leaves. I had, naturally, been moving them all the time.

You should always take this sort of action when you find loose earth, sand, or a mound of some kind. You don't always need a spade to dig with, either.

Finally, once I had mapped the forest I saved at location 3.11, before standing on the Flipper Plate.

I gave this particular file the suffix 3 (name ENTH3 in section 3) and it can be over-written every time something new is discovered, or when a potentially dangerous move is about to be made, providing it is in the same section of the game.

Prefixes (like 3Enth) are used for permanent saves.

Helpline

The answer to A.D.Marter's shooting gallery problem in ***Castle of Riddles*** came from Jonathan Ormond and Mike Maule.

Arrive at the Shooting Gallery with the ticking case and ticking box. Go N into the Gallery then NW,NE (ignore brooch) SE,NE,NW,SW. Now drop the case (bomb) and the box and go NW,NE,NE into the Riddle Room.

Wait until the bomb explodes. The giants will have gone and the treasures can be collected. The problem at the start of ***Labyrinths of La Coshe*** will be answered next month.

Adam Halley's Black Maze problem in the Castle can be fixed by waving the rod and noting the different colour of smoke in each location.

Jonathan Ormond has also put me right about the OOPS in ***Myorem:*** If you get killed, wait till you are back at the start and then use it. Silly me!

Simon Kemp confirms that J. Holden needs Tom's help in ***Lord of the Rings:*** Go NE to Tom's House, enter SAY TO TOM "HELP" and lead him back to the Willow then go back to Tom's House. Frodo can pass the Barrow Wight by wearing the ring, but also try throwing the pot plant as well (there's an elfstone inside).

Mike Maule's help for Peter Aumayr in ***Pyramid of Doom*** is this: ENTER POOL, GET KEY (large), E, GET POLE, GET WATER, N, E, DIG, GET KEY (tiny), S, DIG, ENTER HOLE, OPEN DOOR, UP, GET STONE, OPEN DOOR, ENTER DOOR, LIGHT FLASHLIGHT...

For ***Pirate Adventure:*** The key is under the mat in the flat. John Tipper says go to the thin crack, get the hammer, return to the flat and remove the nails from the rug which can now be lifted.

To pass the crocs drop the bottle of

Location	Description	Direction	Result
3.01	Forest: coin dropped	N	3.02
		NE	3.05
		E	3.04
		SE	3.04
		S	3.04
		SW	3.08
		W	3.07
		NW	3.07
3.02	Forest: pliers dropped	N	3.03
		NE	3.04
		E	3.06
		SE	3.04
		S	Same
		SW	3.08
		W	3.07
		NW	3.01
3.03	Forest: flower dropped	N	3.04
		NE	3.06
		E	3.06
		SE	3.04
		S	3.02
		SW	3.01
		W	3.10
		NW	3.05
3.04	Forest: decibox dropped	N	3.05
		NE	3.07
		E	3.08
		SE	3.06
		S	3.01
		SW	3.03
		W	3.05
		NW	3.02
3.05	Forest: cushion dropped	N	3.06
		NE	3.04
		E	3.03
		SE	3.07
		S	3.04
		SW	3.02
		W	3.02
		NW	Same
3.06	Forest: mat dropped	N	3.04
		NE	3.05
		E	3.08
		SE	3.03
		S	Same
		SW	3.07
		W	3.02
		NW	Same
3.07	Forest: oar dropped	N	3.06
		NE	3.03
		E	3.02
		SE	3.01
		S	3.08
		SW	3.04
		W	3.05
		NW	Same
3.08	Clearing, archway to cubicle in centre	N	3.07
		NE	3.01
		E	3.01
		SE	3.04
		S	3.04
		SW	3.01
		W	3.04
		NW	3.05
		IN	3.09
3.09	Teleport booth	OUT	3.08
		PUSH	5
3.10	Forest: goggles dropped move leaves for Flipper Plate	N	3.01
		NE	3.04
		E	3.03
		SE	3.02
		S	3.07
		SW	3.05
		W	3.06
		NW	3.01
		STAND	3.11

Figure I: The forest maze after S3 pressed

rum in the pirate's shack, go back to the secret passage and get the empty bottle, go to the beach, wear the water wings and go to the lagoon to get some fish for the crocodiles. John sent in a nice map of the game.

And for ***Strange Odyssey:*** RESET PHASER, TO DESTROY, SHOOT BOULDER.

J.W. Hargreaves' problems in ***Countdown to Doom*** are solved as follows: In the metal corridor in the dome are niches marked with symbols. Note the order (different each time) as you need this information later. At the Pentagon Niche, PUSH PENTAGON, L, R, L, F, F, L, D while collecting the four discs on the way.

The answer to his problems in ***Hulk:*** To start – BITE LIP, GET FAN, GET GEM, E, PUSH BUTTON, BITE LIP, GO TUNNEL. This takes you past the high gravity area into a field.

Nick Southgate's ***Gremlins*** problem: To disable the snowplough you need the welding torch, gas bottle with valve and pipe, plus the electronic spark igniter. Then OPEN VALVE, IGNITE TORCH, WELD PLOUGH, CLOSE VALVE (gas needed later). PUSH BUTTON to use flash on the camera and scare the Gremlins.

Mike (120 adventures completed) is a helpliner connected with the fanzine Guiding Light and can be contacted on 0502-82774 between 7pm and 9pm seven nights a week.

For Guiding Light details and other Helpline contacts write to Roger Garret, 52 Micawber Way, Newlands Spring, Chelmsford Essex.

Some ***Bored of the Rings*** tips from Nick Sayer: The password for part 2 is Psychoanalysis, and for part 3 Psychoanalysis again. For Sceptical, don't ask us.

Hall of Fame

Nigel Allen has introduced me to another way of mapping, particularly useful for mazes. Watch this space for an example from **Philosophers Quest.**

Here's more of Stuart Booth's solution to **Snowball.**

The crew member: Go through the airlock doors at the North end of the cylinder. Continue going North, examining the bracelet each time you reach the flexible tube, until the last colour on the bracelet is the same as the first colour that you wrote down.

Go down and into the elevator, then press the third colour button of the crew members' colour sequence. If at any time you hear quiet clanking, open a mortuary door, go in and wait for the clanking to fade away.

Walk along the corridor examining the lights until they are the same as the first three codes of the crew

Turn to Page 88 ▶

Hall of Fame

◀ *From Page 87*

members' colours.

Enter the green or blue mortuary (according to what the mempak said) and press the coloured buttons on the panel corresponding to the last three colour codes that you wrote down.

Take the coffin to the revival chamber North of the elevator and give the coffin's occupant the cup of liquid (100). Note down the Habi-dome's security code. Take the elevator to black level and return to freezer control. The bracelet and stacker lift have no further use.

The Habi-dome/Snowball Hilton: Go to the South end of the cylinder. Enter the airlock and wear the helmet. Leave the airlock and go into the hanger. Take the gun.

Travel to the pylon either by following the web or by leaving the web with the lamp on, holding the gun.

Fire the gun when told to. Climb the pylon, enter the shuttle and press the button (50). Go down and into the Hilton.

Go through the airlock and drop then take the helmet to preserve air. Go South and take the paint can and the flask. Insert paint can into toolbox, go down to the round room and enter the security code (50).

Take the holo-wand to remove the illusions. Take the tray from the lounge and put objects on to it that the toolbox won't accept. Close the toolbox, wear the helmet and go down through the airlock to the observatory. Take and wear the glasses.

Now go to the pink room and take the cat. Do not take anything from the ground or drop it while holding the cat. Make sure the toolbox is closed and leave the Habi-dome.

Catch the shuttle past the snowdozer to Jacob's ladder. The debt card's only use is with the droid counters – to allow instant access, with a ticket, to the lance. The gun's only use is to aid movement in space. The debt card, gun and holo-wand have no further effect on play.

Problem Corner

If Alasdair Rawson of Alsagar, Staffs cares to send me a black ink map of Ultimate's **Knightlore** we might be able to reproduce it in the column. He also needs help in **Nightshade.**

Andrew Grocott is stuck in the Mines of Moria (a maze?) in **Lord of the Rings.**

Philip Ward needs help in **Gisburne's Castle.** How does he use the dynamite, flint, broom and oil; how does he open the chapel door? He offers hints, too: Use the coins, gold and so on (don't hoard them) but the pink bottle is a valuable shrink-aid.

Vivienne Sutherland of Shetland can't even get started in **Questprobe, Human Torch** and **The Thing.** The Thing keeps getting sucked into the tar pit.

Apart from collecting 1000 points in **Twin Kingdom Valley,** is there anything else Neil Carson has to do to finish the game officially? He too is stuck in **Gisburne's Castle;** he thinks he needs to enter a monastery, and finds shooting Gisburne with a cannon not a lot of help! ■

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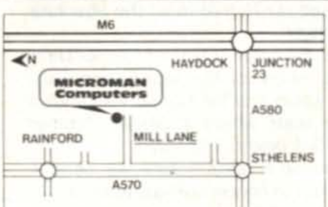

Mike Cook lets his BBC Micro dip its toe and test the temperature

Some like it hot

TEMPERATURE measurement is a subject so far neglected in the Bodybuilding Course so let's rectify that right away and look at some of the various techniques for getting your micro to measure temperature.

Just what is temperature? Well a simple explanation can be obtained if you consider that everything is made of atoms. The atoms in a solid are evenly spaced to form a crystal lattice and the shape of the spacing is dependent on the type of atoms involved and the way they bond together.

For instance diamonds, which are simply crystallised carbon, form regular cubes with the atoms at each corner. These atoms vibrate slightly and the amount of vibration is what we call temperature.

When they are not vibrating much we say a substance is cold and when they are vibrating a lot we say it is hot.

The vibrations can become so violent that the bonds holding the atoms in place are broken and the substance melts. Even more vibrations and the liquid turns into a gas with individual atoms flying all over the place.

At the opposite extreme, when the vibrations stop completely the substance is as cold as it can get – the temperature known as absolute zero.

There is a scale of temperature measurement that starts off here, known as the Kelvin scale. The size of points on this scale are the same as the Celsius scale commonly in use, the difference is that 273.15 degrees Kelvin is 0 degrees Celsius.

So conversion is easy – simply subtract 273.15 from a temprature in Kelvin to get the equivalent in Celsius. All scientific work is carried out in degrees Kelvin and is referred to as the absolute temperature.

There are other scales of temperature as well, such as the well-known Fahrenheit scale and the not-so-well known Reamur scale where 1 degree Reamur equals 5/4 degree Celsius.

To measure temperature we need a transducer to convert temperature into a voltage – voltage is easily readable by the BBC Micro and the built-in analogue to digital converter will give you an acceptable reading.

The main sources of error are that the voltage reference is not entirely stable and the conversion has some noise on the signal. The conversion is nominally accurate to 10 bits but I don't really trust it above 8 bits.

Another point is that the built-in converter gives its reading not in volts but in arbitrary units. This means that for any type of absolute measurement you need to calibrate the converter.

However, for a really accurate reading you will need to use the digital voltmeter (DVM) described in the April 1985 issue of *The Micro User*, and available as Bodybuilding Pack No.22.

This gives you four and a half digits accuracy and the ability to measure positive and negative voltages. The output of the DVM reads directly in volts making conversion into temperature quite straightforward.

The simplest temperature transducer relies upon the effect that in any conductor the resistance changes with temperature. As I said before, all materials are made of atoms, and those in conducting material can be thought of as being surrounded by a sea of free electrons and the movement of these is what we call electricity.

In any substance, the more electrons there are and the more easily they can move, the better the material will conduct electricity. A good conductor has low resistance and a poor conductor high resistance.

One of the things stopping electrons from moving freely is that they keep bumping into the atoms and if the atoms are vibrating a lot the chance of a collision increases. Therefore, as the temperature of a conductor increases its resistance will increase too. This effect can be used to make a resistance thermometer.

The theory is simple; just pass a current through a conductor and see how well it flows – the hotter it is the worse it will flow. Whereas in theory any conductor can be used, in practice we use a metal that has a comparatively high resistance to start with and that also gives reliable and repeatable results – platinum.

A platinum resistance transducer is simply a length of platinum wire or foil and it can be used for measuring temperature between –70 and +600 C with very good stability.

They can be quite expensive, especially wire-wound high quality standard ones, but the foil type are cheaper and for most purposes perform just as well.

Typically they have a resistance of 100Ω at 0°C and this increases to 138Ω at 100°C, with a stability of ±0.05%. The change is linear so each degree rise produces exactly the same size of increase in resistance and this can easily be converted into a change in voltage by the circuit shown in Figure I.

The resistance change is linear with temperature and so to make the voltage change linear we need to feed it with a constant current. The simplest way of achieving this is to use a constant current diode.

The one shown will provide 1mA and is not subject to temperature variations as it has a stability of about 1μA per degree Celsius. It is best to run resistance transducers at low current to prevent any self-heating affecting the measurements.

As you can see, while a platinum

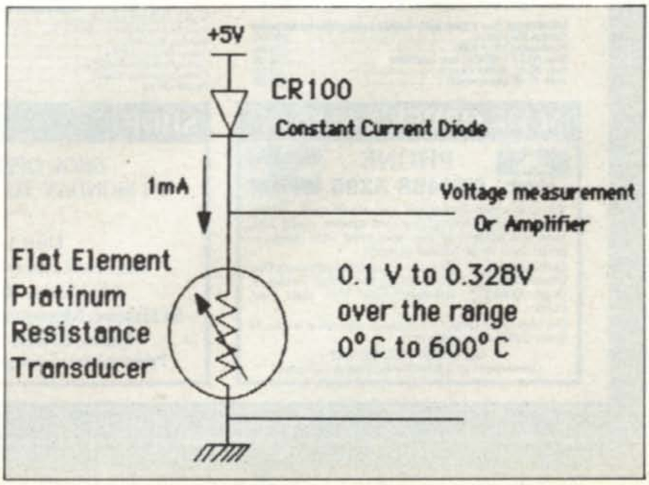

Figure I: Changing resistance to voltage

resistance transducer is very accurate and can cover a wide temperature range it is not very sensitive. In other words there is not much change in the resistance for wide temperature changes.

While the circuit in Figure I will work, the resolution of the built-in analogue input port will give very coarse temperature steps and much better results will be obtained with the DVM.

Most platinum resistance transducers are used with amplifiers to increase the signal and unless you need to measure high temperatures with your micro there are better transducers to use.

A common and cheap transducer is the thermistor which is made not from conductors but from semi-conductors – materials that should have no free electrons and hence will not conduct at all.

However, at normal temperature the vibrations of the atoms will dislodge sufficient electrons to make it conduct, albeit poorly. Now the hotter the material gets the more electrons are dislodged and the better it conducts.

In other words, as the temperature increases, the resistance decreases. This is known as a negative temperature coefficient and is the opposite of the positive coefficient of the metal transducers just discussed. This effect is still at work in a semi-conductor but is negligible as it is swamped by the release of extra electrons.

Normal semiconductor materials such as silicon or germanium are very sensitive to impurities and so most thermistors are made from mixtures of metal oxides such as nickel, cobalt and manganese combined under heat and pressure.

Thermistors provide good sensitivity over a reasonable temperature range and are made in a variety of shapes and sizes, a common one being a small bead set in glass.

The only fly in the ointment is that they give a non-linear output, so the change in resistance per degree Celsius depends on the temperature of the thermistor. However, temperature response is repeatable and can be compensated or linearised.

THE BEEB BODY BUILDING COURSE

Figure II shows a simple thermistor temperature probe for the BBC Micro. The resistor Rs will allow us to measure the resistance change and, if chosen correctly, will also act to linearise the thermistor's response.

By choosing a high impedance thermistor we are able to use the reference voltage of the analogue input port without unduly loading it.

As we have a non-linear response and the BBC Micro giving readings in arbitrary units, the best way to use this circuit is to calibrate it using an ordinary liquid-in-glass thermometer and a thermistor in a beaker of ice and water.

Heat the water slowly and note the reading from the analogue input channel and the thermometer in, say, 10 degree Celsius steps. I always use the statement V=ADVAL(1)DIV 64 to get readings between 0 and 1023 as this is the maximum resolution the built-in analogue to digital converter can give you.

Take the readings and place them in an array. You can now use this to "look up" any reading from the analogue channel and convert it into temperature. Note that you will only be able to resolve temperature accurately in the increments you have calibrated.

If you get a reading between those in your look-up table then you can make a reasonable guess by assuming the thermistor response to be linear between the calibration points. This is known as straight line interpolation.

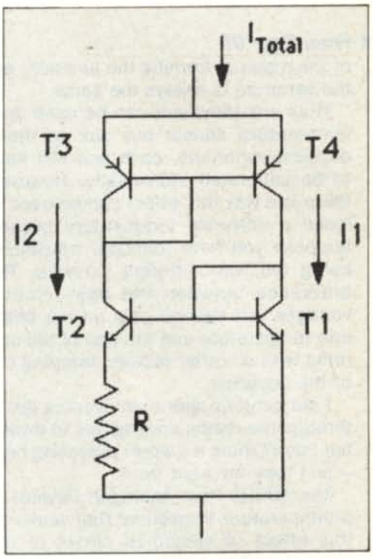

Figure III: The AD592 transducer

As an instance I have calibrated an NTC Type G Thermistor and a program to perform the necessary conversion is shown in Listing I.

Remember that if you are making temperature measurements some distance from your micro, the resistance of the connecting wire might have an effect and the simplest way to compensate for this is to have the length of cable in circuit when the calibration is made.

Alternatively you can take the thermistor's calibration curve and work out the resistance you will get at each temperature step. As we are using the reference voltage, you can calculate the fraction of that voltage that will be fed to the analogue input port and hence you can calculate the reading for a series of temperatures.

This is less accurate than measuring temperatures as you are relying on the accuracy of the calibration curve.

There is a third class of temperature transducer and this perhaps has the greatest benefits for the computer user – the solid state transducer. This is based on the principle that the forward voltage drop across a semiconductor junction varies with temperature.

For instance, the base emitter voltage of a transistor will vary by 2.5mV per degree Celsius providing the transistor is drawing a constant current. The actual size of the voltage depends on what current is being drawn along, the physical size of the junction and the composition

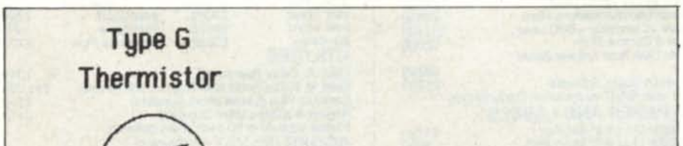

Figure II: A thermistor temperature probe

Turn to Page 92 ▶

◀ *From Page 91*

of the material forming the junction, but the variation is always the same.

Thus any transistor can be used as a temperature sensor but due to these physical variations, each one will have to be calibrated individually. However, there is a way this effect can be used to make a universal temperature sensor. Suppose you have identical transistors being fed with different currents. The difference between the base emitter voltages will depend only on the absolute temperature and the size of the currents with all other factors dropping out of the equation.

I did actually spend an evening going through the maths proving this to myself but I don't think it's worth repeating here – just take my word for it.

The AD592 from Analogue Devices is a temperature transducer that works on this effect. A simplified circuit of the device can be seen in Figure III.

It works like this: Assume that the transistors are all perfect and produced on the same slice of silicon so that they are all at the same temperature and as far as possible identical.

Transistors T3 and T4 act as a current mirror which means they will split any current into two equal parts, I1 and I2. These currents are then fed to two transistors T1 and T2, but in fact T2 is not one transistor but eight transistors in parallel.

This splits I2 so that the current density in T1 is eight times the density in

```
10 MODE7
20 PRINT TAB(0,4)"THE BEEB BODY BUILD
COURSE"
30 PRINT"MICRO USER MARCH 1987"
40 PRINT"By Mike Cook"
50 PRINT"Thermistor thermometer"
60 READ N%
70 DIM RD%(N%+1),TMP%(N%+1)
80 FOR A%=1 TO N%
90 READ RD%(A%),TMP%(A%)
100 NEXT
110 RD%(N%+1)=2000
120 *FX16,1
130 REPEAT
140 ACC%=0
150 T%=5
160 FOR A%=1 TO T%
170 ACC%=ACC%+(ADVAL(1) DIV 64)
180 TIME=0
190 REPEAT:UNTIL TIME>10
200 NEXT
210 R=ACC%/T%
220 REM Now search for value
230 PRINT TAB(0,14);"Temperature is";
240 S%=0
250 REPEAT
260 S%=S%+1
270 UNTIL RD%(S%)>R
280 IF S%=1 OR S%>N% THEN PRINT "OUT O
F RANGE":GOTO 320
290 F=(R-RD%(S%-1))/(RD%(S%)-RD%(S%-1)
)
300 HOT=TMP%(S%-1)+((TMP%(S%)-TMP%(S%-
1))*F)
310 PRINT INT(HOT+0.5);" C"
320 UNTIL FALSE
330 DATA 11
340 DATA 337,0,453,10,588,20,674,30
350 DATA 767,40,837,50,882,60
360 DATA 921,70,942,80,959,90,972,100
```

Listing I

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the other leg. As all eight transistors in T2 are in parallel they will all have the same base emitter voltage.

The difference in base emitter voltage of the two transistors is developed across R. Thus the voltage across R is proportional to the absolute temperature of the transistors.

The current I2 will be determined by the voltage across R and, as I1=I2, so will the current through the whole device. Therefore the total current through the device will be proportional to absolute temperature.

If we make R a suitable value then we can have a convenient relationship between current and temperature. In fact if you do the maths the difference between the two base emitter voltages works out as:

```
Vt=((k*T)/q)*Ln(I1/I2)
```

Where k is Boltsman's constant, q is the charge on an electron and T is the absolute temperature, Ln is the natural logarithm function. As the ratio of the two currents I1 and I2 is 8, it works out that the voltage across R can be calculated using Vt=179 * T µV (micro Volts).

Now, as the current through R is half the total current, if we make R equal to 358Ω then the current will increase by 1µA for every degree Kelvin rise.

Don't worry if you did not follow all that, the upshot is that the AD592 will give a current output proportional to absolute temperature, as in Figure IV.

As it is a current output we do not need to worry about the resistance of any long connecting wire. We simply pass the current through a known resistor and output voltage will be a direct measure of temperature.

For instance if we make Rm 1k then we will have a voltage of 1mV per degree K. Remember this is absolute temperature so you will get a standing voltage of 273.15 * 1mV or 0.27315 volts at the freezing point of water and 0.37315 volts at the boiling point.

By increasing the value of Rm you will increase the output and also the offset voltage. To obtain a full scale reading (2V) at 100°C then make Rm 5.35k. The AD592 has an absolute accuracy ±2.5°C max at 25°C and can operate between −25°C and +105°C.

It can be made to give a much smaller maximum error if the system is calibrated at a single temperature. This is done by making part of the resistance variable (usually about 0.1 of the total resistance) and adjusting it until the correct reading is obtained.

This is shown in Figure V. By using this method you can get the error down to below 1°C.

Transducers for temperature measurement may be a little hard to find so I have made some available as Body Building Pack No.40 using the order form shown. Note the packs do not include the 15 way D-type socket needed to connect up to the analogue input port.

Having acquired the ability to measure temperature you can use it in a variety of ways.

If you are using it as part of a weather station you can take both air and ground temperature. Do this by taking three or more transducers and burying them at different depths.

The best way is to attach them to a rule and bury the rule, about 6 inch gaps should be sufficent. The soil temperature will tell you a lot about the long term climate as it takes a longer time to change the temperature the deeper you go.

Of course this will depend to some extent upon the soil type but it should give you some interesting data to play with.

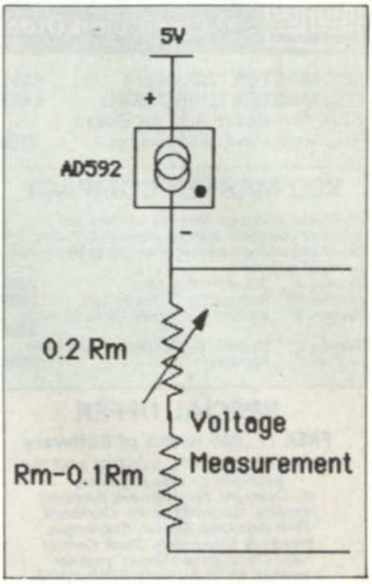

Figure V: Minimising the error

I am aware that there are other solid state temperature sensors that produce an output in volts as well as other techniques of temperature measurement such as thermocouples but I am afraid they will have to wait until another month.

● *So as the heat sinks slowly in the west I will wish you goodbye until next month.*

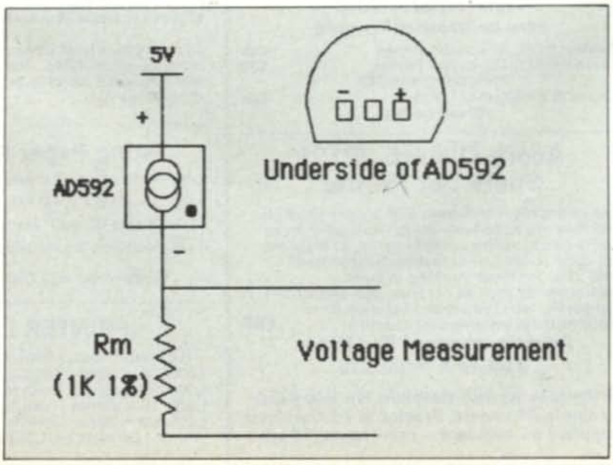

Figure IV: Current output proportional to temperature

BEEB BODY BUILDING PACK ORDER FORM

Body Build Pack 40 to build
Figure I Diode and sensor *£13.00*
Figure II Thermistor and resistor *£8.50*
Figure IV AD592 and resistor *£6.00*
Also available
Pack 22 DVM assembled and calibrated.............................. £40.00
Pack 22 DVM kit £35.00
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Name...
Address.....................................
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Post code...................................

All prices include VAT and P&P

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8 Fairhill, Helmshore, Rossendale, Lancs.
BB4 4JX
Foreign orders add £3 if airmail delivery is required.

ORDER VIA
MicroLink
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Watford Electronics

Jessa House, 250 Lower High Street, Watford WD1 2AN, England
Tel: Watford (0923) 37774-40588 Tlx: 8956095 Fax: 01 950 8989

All prices exclusive of VAT; subject to change without notice & available on request.

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BBC MASTER 128K Micro	**£395**
BBC MASTER TURBO 4MHz	**£493**
512K Processor Add on Board "inc. Mouse and GEM package"	**£195**

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All Master Compact Microcomputers are supplied complete with an integral 3½" Disc Drive and various educational and professional bundled softwares.

System 1	Standard Package	£385
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FREE . . . £80 worth of Software

Gemini's OFFICE MATE & OFFICE MASTER packages on Disc consisting of: Database, Spreadsheet, Beebplot graphics. Accounts packs: Cashbook, Final Accounts, Mailist, Easyledger, Invoice & Statements, Stock Control and Computer Concepts' popular Interword wordprocessor ROM; WHEN YOU BUY YOUR BBC MASTER or COMPACT COMPUTERS FROM US.

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BBC MASTER ET (Econet Terminal)	£315
Econet Module for the Master	£43
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Reference Manual I	(No VAT) £14
Reference Manual II	(No VAT) £14
Advance Ref. Manual	(No VAT) £19
64K Upgrade Kit for B+	£32
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ALL ECONET UPGRADES Available	
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Upgrade for Bitstick I to II	£450
Bitstick Multiplotter Driver	£65

(Securicor carriage £7)

CO-PRO ADAPTOR

Now for the first time you can add the Master Co-processor boards, to your standard BBC model B, or B+. With this brand new launch from Watford Electronics. You can attach any BBC Master Co-processor to the original BBC Micro. Once again Watford forges ahead with a new concept in BBC micro addons. This unique external CO-PRO ADAPTOR, is protected by patent applications.

Use the super fast Turbo Board with your BBC B, it is much faster than the 6502 2nd processor it supercedes.

With the 512K addon your standard BBC machine achieves IBM PC compatibility at a realistic price running GEM, Lotus 123 and many other programs.

To use this addon you require a BBC model B, fitted with DNFS 1.20 or BBC B+ fitted with 1770 DFS 2.20 or greater. Co-processors work exactly as if they were second processors.

Master owners may use this interface to add a second Co-processor.

Watford, brings power to your BBC at only: **£50.00** (carr £5)

By popular demand our retail shop is now open until 8.00pm. every Thursday.

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● EPSON FX85 Printer	£315
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● EPSON LX80/86 Tractor Feed	£20
● EPSON LX80/86 Sheet Feeder	£49
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● EPSON FX1000 Printer	£425
● EPSON EX800 Printer	£405
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RX & FX PRINTER INTERFACES

Epson interfaces fit inside the printer to allow connection using techniques other than Centronics.

RS232	£2"	RS232 + 2K Buffer	£55
IEEE 488	£65	RS232 & 8K Buffer	£75

CENTRONICS GLP & Brother M1009 (NLQ) Printers

A major price break-through in NLQ Printers from Watford.

At last, a low cost full feature printer, supplied complete with Watford's own NLQ ROM (separately at no extra cost). Due to Watford's bulk purchasing power and low margins we can now offer this incredible printer deal direct from the manufacturers to our customers.

Features include, Epson RX Compatible commands, Near Letter Quality print, 50 CPS Draft mode, Centronics parallel interface, Single, Double & Quadruple density graphics modes, Subscript & Superscript, handle up to 9½" wide standard paper, Friction Feed standard, Low cost Tractor feed optional extra, Bi-directional logic seeking.

*Special Offer **£95** (carr £5)*

Tractor Feed Attachment ***£5***

PRINTER SHARERS

(Ideal for School environment)

Connect 3 BBC Micros to 1 Printer	£60
Connect 6 BBC Micros to 1 Printer	£99
PRINTER CHANGER	
Connects 3 Printers to 1 Micro	£65

(Cables extra)

Acorn-Olivetti JP101 Spark Jet Printer

One of the main problems with most printers is that they are hopelessly noisy. How often have you wanted to print something late at night but not done so for fear of waking the children? Also ideal for those working in quiet environments such as libraries, etc. Silence the complaints with the serious solution from Watford at the amazing cost of only **£59**

Accepts standard 9½" Paper.

Pack of 4 refills **£10**

JP101 accepts 9½" standard fan fold paper or single A4 sheets. Tractor & Friction feed supplied as standard – print speed 50 cps.

RS232 Kit for the COMPACT
£26

SPECIAL OFFER

EPROMs for BBC's Sideways ROMs.

2764-250nS £2.50
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RAMs (Low power) for ATPL, WATFORD, etc., Sideways ROM Boards

6264LP (8K) £2.90
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KAGA/TAXAN PRINTERS (IBM/Epson compatible)

KAGA KP815 Printer
Only £239 (carr £7)

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PRINTER LEADS

Centronics lead to connect BBC micro to EPSON, KAGA, SEIKOSHA, NEC, STAR, JUKI, BROTHER, SHINWA etc. printers.

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Type	Ribbons	Dust Covers
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FX100	£7.00	£5.25
FX80-MX80-FX85	£4.50	£4.95
RX80	£4.50	£4.50
LX80	£4.00	£4.50
GP80	£4.50	£4.00
GP100-GP250	£5.95	£3.95
Centronics GLP	£4.00	£3.75
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CANON PW1080	£5.25	£4.75
Panasonic KX1080	£7.75	£4.75
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Our attractive Dust Covers are manufactured from translucent PVC. The seams are stitched and edges are taped to prevent splitting due to continuous use.

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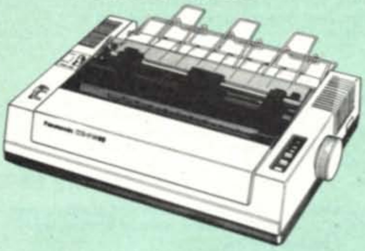
Carriage on 1,000 Labels £1.00

Panasonic KX-P1080



from the prodigious Japanese Stable of Panasonic comes this fabulous new NLQ Dot Matrix Printer

Available NOW at a superbly realistic price, the KX-P1080 perfectly balances features, quality of construction and Value for Money to produce the printer of tomorrow, here today, ready to sweep the current generation of machines away.

Ingenious innovation in terms of software control codes permits great flexibility when it comes to defining the print style. A nippy 100 cps of clear Draft text backs up the crisp 20 cps Near Letter Quality text mode, with upto 40 superbly useful downloadable characters. A delightful range of assorted character widths is efficiently supported, with sizes ranging from a broad 5 cpi to petite 17 cpi, EVEN in NLQ mode. Some of the extensive support for serious use includes specialised functions to perform justification, centering and even left and right ranging. Proportional spacing permit even greater freedom when it comes to advanced use. Not only is the full Epson RX compatible control code set implemented, but extra codes have also been added to cater for the NLQ options, etc.

A full 96 ASCII character set is supported, with an extended set of 32 international characters A 1K Print Buffer alleviates much of the wait time normally associated with printing, whilst the bi-directional logic seeking print head takes the quickest route to print as required.

The draft text is implemented with a 9 × 9 matrix, with Near Letter Quality effected by means of an 18 × 18 matrix.

(Price inludes, FREE A 4ft Printer Lead, and a Dump Out 3, Screen Dump ROM worth £35 with every printer purchased from us).

Special Price: **£149** (carr. £7)

Panasonic RS232 Interface: **£39**

Panasonic KX-P1091 Dot Matrix Printer

Similar to KX-P1080 but has a speed of 120 cps and is IBM/Epson comptible

Price £249 (carr £7)

Panasonic KX-P3131 Daisy-Wheel Printer

A few months ago, we introduced the KX-P1080 to our large and discerning customer base. As a result of the enthusiastic and overwhelming reaction to this versatile dot matrix printer (see above for details), we are now extremely pleased to be able to bring you details of the fabulous KX-P3131 Daisywheel Printer, also from Panasonic. The KX-P3131 printer is the ideal printer for the home user wishing to produce clear, immaculate letters or reports.

Ideally suited to the pocket of the home user, costing not much more than a pair of disc drives, this daisywheel printer delivers flawless text at 10, 12 or 15 characters per inch. It also supports proportional print mode.

Printing at a respectable 17 characters per second, the KX-P3131 features a capacious 6 kilobytes printer buffer to swallow most printing requirements with ease. For the more demanding user, there is a 32 kilobytes printer buffer option available. Taking paper up to 13.5" wide, the KX-P3131 prints with bidirectional logic seeking, ensuring the minumum time to print your text.

Only **£218** (carr. £7)

Single Sheet Feeder	**£195**
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We stock a range of monitors to suit all needs. Choice of a monitor is a matter of personal taste so we recommend that whenever possible, you ask for a demonstration at our shop. All Monitors are supplied complete with connecting lead.

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ZENITH

"Test Bureau Recommended for use in Education"

12" high resolution monochrome monitor. Ideal for word processing as its green or amber screen is very restful to read. (These are the same professional quality, stylishly finished monitors as used in the larger Zenith PC Systems.)

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BNC Lead for Zenith or Philips	**£3**
Skart Monitor Lead	**£5**
RGB lead for KAGA	**£3**

N.B. carriage on Monitors **£7** (securicor)

SWIVEL BASES

for Video Monitors

By placing your monitor on one of our superb swivel bases, you gain the freedom to adjust the monitor viewing angle to suit your needs. By doing this, you alleviate eye strain and reduce back stress.

for 12" Monitors **£10** (carr. £2.50)
for 14" Monitors **£14** (carr. £2.50)

INCREDIBLE WORD PROCESSING DEAL ! ! !

Watford Electronics, already renowned for quality products at discount prices, are offering, the truly spectacular BARGAIN OF THE YEAR!

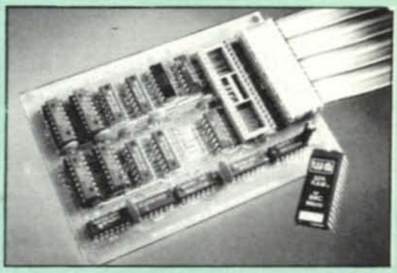
A Watford's 32K Shadow RAM Card – Printer Buffer and the much sought after, Computer Concepts' Inter-WORD, (a very powerful package) All this at an astounding price of:

Only £89 (carr £2)

32K

SHADOW RAM-Printer Buffer

Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B¿ or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

● IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.

● "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.

● In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This product is recommended as an ideal complement by Computer Concepts.

● Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.

● Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15,21,138,145,ADVAL etc). Please note only a 12K printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.

● Ensure COMPATIBILITY with a vast range of hardware (including our ROM board, the ATPL ROM boards, double density boards, second processors), and software (including BASIC, TOOLKIT, VIEW, WORDWISE (1.20+), WORDWISE-PLUS, Music 500's AMPLE). This is because our board, unlike those of our competitors, is connected to the computer by a ribbon cable and has the power consumption of a couple of ROMs!

● Achieve EASY OPERATION with ROM based software. A large range of commands is available for machine code and BASIC users, including some useful *HELP messages, and a comprehensive manual is supplied free.

● Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

Only £59 (carr £2)

(Price includes a comprehensive manual and the ROM)

Continued ⟶

Mark II Light Pen

You no longer have to fiddle with the brilliance control or work in the shade as this NEW Mark II Light Pen is totally insensitive to local lighting conditions. It only operates on high frequency light from the TV or Monitor. The red LED Indicator on the Mk II pen, lights up when valid video data is available. Your program can have access to this signal allowing computer verification of target for high res drawing. The conveniently located switch on the pen body allows the computer to ignore any stray signals. Supplied complete with the sophisticated PEN-PAL Software on Cassette or Disc. Please specify.

Special Offer Price: £15

THE EPSON RX-FX-KAGA PRINTER COMMANDS REVEALED (BOOK)

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, Canon PW1080A or any Epson FX80 compatible Printer with the BBC Micro, both from Basic and Wordwise.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

Superb Value at **£5.95** (No VAT)

NOW WITH EXTRA FEATURES AT NO EXTRA COST
Watford's latest DFS 1.44

- Incorporates Acorn's Official Tube Host Code so that those with 2nd processors no longer need to waste a ROM socket on the DNFS.
- Option to DOUBLE the speed of BPUT and BGET.

If you already have the Watford Electronics DFS and wish to incorporate these new facilities ten simply return your existing DFS ROM to us together with £5 remittance for an upgrade. Please pack the ROM securely and address the package to our Upgrades Dept.

WATFORD's & ACORN's SINGLE DENSITY DFS

Watford's popular and widely acclaimed DFS has now been available for four years, and has gained a large following amongst serious users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade. ***(P.S. Watford's highly sophisticated DFS is fully compatible with Acorn DFS).***

PRICES

● *Complete Disc Interface Kit including DFS ROM and fitting instructions*	**£62**
● *Acorn's 0.90 DFS Kit complete*	**£57**
● *DFS Manual (Comprehensive)* *(no VAT)*	**£6.95**
(P.S. Our comprehensive DFS Manual covers both Acorn & Watford DFSs).	
● *Watford's sophisticated DFS ROM only*	**£16**
● *We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only*	**£12**
● *DNFS ROM only* **£17** ● *ADFS ROM only* **£25**	
● *Watford's DFS is exclusively available from Watford Electronics and their appointed dealers only. Every ROM carries a special label with LOGO and serial number.*	

WATFORD's DOUBLE DENSITY DFS INTERFACE

The DDFS from Watford Electronics represents a new standard in DFSs for the BBC micro. This is a double density version of our popular single density DFS, and combines all the features of this powerful DFS with the advantages of a system that gives 80% more storage per disc in double density mode. P.S. – Please note that not all DDFSs are capable of providing either the full 80% storage increase, or of allowing a file the full size of the disc – Ours allows both of these! Operates both in Single & Double Density modes.

The typical piece of games software these days is provided upon a protected disc. In order to work on any double density system (including the others on the market) a protected piece of software needs to make calls through the OSWORD &7F routines. To ensure compatibility, the Watford DDFS features probably the most comprehensive and powerful 8271 emulation ever written for a double density system.

PRICES

● *Complete DDFS Kit incl. fitting instructions*	**£46**
● *DDFS Manual* *(no VAT)*	**£6.95**
● *We will exchange your existing Single Density DFS Kit for our DDFS Unit at*	**£29**

BBC MICRO BUSINESS/ WORD/PROCESSING PACKAGE

A complete word-processing package (which can be heavily modified to your requirements, maintaining the large discount). Please telephone or call in at our retail shop to discuss your particular requirement and a demonstration.

EXAMPLE PACKAGE

BBC Master 128K Micro, View wordprocessor, Viewsheet, Basic Editor, Terminal Emulator, Twin 800K 40-80 track double sided Disc Drives, Zenith Hi-Res green monitor, Panasonic KX-P3131 professional quality Daisy Wheel printer, Gemini Database, Spreadsheet, Beebplot Graphics, Cashbook, Final Accounts, Mailist, Easiledger, Invoice & Statements, and Stock Control packages on disc with manuals.

Only £899

A Low Cost wordprocessing package: Same as above except, a single disc drive instead of a twin and Olivetti Spark Jet Printer instead of Panasonic.

Only £625

MYSTERIES OF DISC DRIVES & DFS REVEALED (BOOK)

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

For instance, what is the difference between single and double density formats, how can you use a 40 track disc on an 80 track disc drive[What is the difference between a DFS and disc interface kit? Should you acquire a single Disc drive or twin[What does 48 TPI and 96 TPI discs mean? These are just a few of the questions you may have asked yourself and never found the answer or maybe you have yet to encounter these questions.

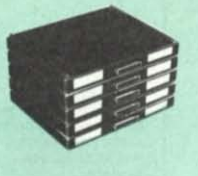
Now the mystery of buying a suitable interface and disc drive for your BBC micro is revealed in Watford's new book entitled 'MYSTERIES of DISC DRIVES & DFS REVEALED'. It describes in fine detail, yet remaining very readable to the beginner, how disc drives operate, the type of interfaces available, which type of discs to use on a disc drive and how data is stored on the discs.

£5.95 (Book No VAT)

DISC ALBUMS

Attractively finished in antique brown leather look vinyl. Stores upto 20 Discs. Each disc can be seen through the clear view pocket.

£4



STAK-PAK

The unique computer program filing and storage system. Made of tough black plastic, these compact drawer sections hold two cassettes each and lock together vertically to form miniature cabinets of any height. Each drawer section has two C12 Data Cassettes with labels plus external index card.

Five twin Packs incl.
10 Cassettes Only: **£5**

FLOPPY HEAD CLEANER KIT

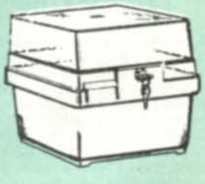
The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use.

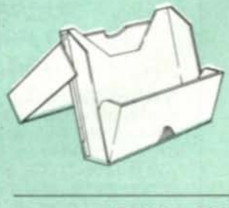
£8

ANTISTATIC LOCKABLE DISC STORAGE UNITS

Gives double protection – Strong plastic case that affords real protection to your discs. Antistatic helps avoid data corruption whilst in storage. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

● M35 - holds upto 50 discs	**£8**
● M85 – holds upto 95 discs	**£10**





PLASTIC LIBRARY CASES

FOR 5¼" DISC STORAGE holds 10 Discs. **£2.00**

DUST COVERS (For our Disc Drives)

Single CLS (without PSU) ***£3.20*** Twin CLD (without PSU) **£3.85**
Single CS (with PSU) **£3.95** Twin CD (with PSU) **£3.90**

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates capacity in single density mode. That within the brackets is the capacity in double density mode. All disc drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). All our drives are of Japanese manufacture. All our 80 track drives are already fitted with a 40-80 select switch.

***All our Disc Drives are Double Sided and will operate in both Single and Double Density modes.** Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.*

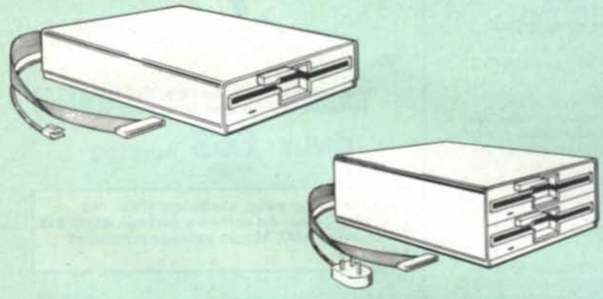
Various other "manufacturers" of disc drives for the BBC micro (more accurately, "packages" label other manufacturers drives with their own name). We buy the high quality JVC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. Ideal for Schools & Colleges. We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below for single drives is for a single drive in a standard single case. Single drive in a dual case cost an extra £5. (At Watford we anticipate your needs of tomorrow, not just today)!

When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space) your BBC, Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with Watford plinth. (Turn to the 10th page of our advert for the Plinths).
P.S. All our 5¼" Disc Drives are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.

Cable to connect 5¼" Disc Drives to BBC Compact
Single £9 Twin £12



Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
200K (360K)	CLS 200 £95		CS 200 £108	
400K (720K)	CLS400S £96	CLD 400 £180	CS 400S £109	CD400 £200
800K (1.44M)		CLD 800S £183		CD 800S £204

- TWIN Disc Drive Case, complete with Power Supply & Cables **£43**

Securicor carriage on Disc Drives £5 to £6

*Prefix **C** = Cased Drive*
***L** = Less PSU*
***S** = Single*
***D** = Double*

*Suffix **S** = 40-80 Switchable*

e.g. CLS400S = Cased drive, Less power supply unit, Single 400K, Switchable (40-80 track).

3M – DISKETTES

Top quality 3M – SCOTCH Diskettes from Watford Electronics (Your 3M Appointed Distributors). All our discs carry a lifetime warranty. These discs are quiet in operation and insert positively with their reinforced hub rings. Boxes of 10 supplied complete with self stick disc labels and write protect tabs.

● *10 × 5¼" S/S D/D 40 Track Diskettes*	***£10***
● *10 × 5¼" D/S D/D 40 Track Diskettes*	***£12***
● *10 × 5¼" S/S D/D 80 Track Diskettes*	***£15***
● *10 × 5¼" D/S D/D 80 Track Diskettes*	***£15***
● *Hi-Density 10 × 5¼" 1.6M D/S D/D for IBM*	***£32***
● *10 × 3½" S/S D/D 40/80 track Discs*	***£20***
● *10 × 3½" D/D D/D 40/80 track Discs*	***£24***

TOP QUALITY 3½" & 5¼" DISKETTES

To complement the range of quality discs and disc drives that WE already sell, WE are now supplying some special offer packs of 10 high quality discs. Each Disc has a reinforced hub ring and carries a lifetime guarantee. These are supplied complete with selfstick labels and packaged in an attractive plastic library disc box to protect them from damage. We strongly recommend these Discs.

DON'T SETTLE FOR LESS, BUY THE BEST

● *10 × **M3** 3½" D/S D/D 80 Track Discs*	***£20***
● *10 × **M4** 5¼" S/S D/D 40 Track Discs*	***£9***
● *10 × **M5** 5¼" D/S D/D 40 Track Discs*	***£11***
● *10 × **M7** 5¼" D/S D/D 80 Track Discs*	***£14***
● *3" Double Sided Discs*	***£3 each***

Special BULK OFFER on 5¼" DISCS

(Supplied packed in plastic storage Units)
(Lifetime warranty on Discs)

BULK PACK DISCS in lots of 100

Type	**S-S 80T**	**D-S 80T**
● Without Sleeves	**£49**	**£74**
● With Sleeves	**£50**	**£75**

ACORN WINCHESTER DRIVES

Suitable for direct connection, via the 1MHz bus, to any BBC running ADFS. These Acorn Winchester disc drives are fast and extremely reliable. Each Winchester comes complete with the Level III Econet File Server software.

10 Megabytes **£1050; 30 Megabytes £1549**

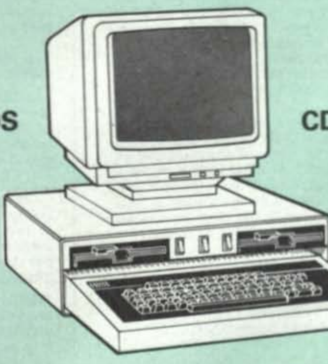
WATFORD's WINCHESTER DRIVES

● 20 Megabytes with ADFS	**£635**
● 40 Megabytes with ADFS	**£999**

WINCHESTER WORKSTATION

20 Megabyte Winchester, plus a Tape Streamer and a 400K Floppy Drive all housed in a plinth with cooling fan **£1499**

CDP 800S **CDPM 800S**



Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The switches are mounted on the front panel for ease of use.

CDP 800S for BBC Micro £210

CDPM 800S for Master £225
(Securicor Carr. £7)

ACORN's Special Twin 800K Disc Drives

Specially mounted side by side in a Master Plinth. Supplied complete with Manual and Cables. Plugs directly to the Master Computer.

RRP £250 **Our Price: Only £199** (carr £7)

EPSON NLQ ROM
for the BBC Micro

Harness the full potentials of your Epson RX & FX Printers. Impress your friends and business colleagues with the quality of your letters and printed material with Watford's very simple to use EPSON NLQ! (Near Letter Quality) ROM. Suitable for FX80, RX80, RX80F/T, FX100.

Look at the features:

- Simply type *NLQ80-100 and a single VDU code to use NLQ print.
- NLQ is then available without any modifications from BASIC, WORDWISE, VIEW (with NLQ DRIVER) or virtually any other program or language.
- Single codes select PROPORTIONAL type (yes even on the RX80) ENLARGED type; UNDERLINED type. These features can be used seperately or in any combination.
- Full UK character set) Standard 'pica size') Proportional spacing; Enlarged; Underlined; Normal type.

The NLQ ROM is supplied complete with comprehensive manual.

P.S. NLQ ROM is compatible with the Torch Z80 system and can be used from within the Perfect Writer software.

Only: £25

VIEW PRINTER DRIVER for NLQ ROM

This specially written printer driver has been designed to allow View access to the full features of our NLQ ROM.
A must for all VIEW and NLQ ROM users.

£7.00

(Hi-View compatible)

THE NLQ DESIGNER

(The First & still the Best)

KAGA KP810-910 and Canon PW1080 are two superb printers, as our many thousands of satisfied customers would surely attest to. One of it's particularly strong points is the NLQ option that it offers; perhaps one of the more weaker points is the effort required to design your own custom NLQ font.

Well the solution is here NOW in the shape of Watford's NLQ DESIGNER ROM! For the BBC Micro. This powerful piece of software allows easy design and entry of a full NLQ font, with further fonts recallable from disc. Once a font has been programmed with the versatile NLQ DESIGNER, it can be saved to disc, downloaded to your Kaga (or Canon) printer, or even programmed into an EPROM (given the appropriate hardware) and then plugged directly into your printer so that it is available immediately when you turn it on.
Downloadable Fonts require 6264 RAM chip fitted. Now BBC Master compatible.

A 40 or 80 track (please specify) FONT Disc containing 9 Fonts, (Italic, Courier, Courier Italic, Script, Copper Plate, Shadow, Bold, Double Print, Gothic and Greek is now supplied FREE with every package.

(P.S. This ROM is not suitable for Epson printers.)

- NLQ Designer ROM & FONT Disc **£25**
- Kaga Individual FONT ROMs **£15**

(Write in for further details).

DUMPOUT 3

A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including all Mode 7 facilities etc. We have to admit that there is one facility that we cannot replicate – if anyone can supply flashing ink we would like to know!
The ROM also provides window setting utilities and two new OSWORD calls that allow mode 7 graphics pixels to be read and plotted using the standard graphic co-ordinate system. The latest version includes a graphic dump trigger for dumping screens from games whilst they are running.
Two commands are used to operate the dump routines(
*GIMAGE – This provides a full graphics dump of any graphics mode, plus modes 7 and '8'. There are many optional parameters but you need only specify the parameters you wish to change.

Features available include:

- Vertical and horizontal scaling through all the graphic modes and mode 7
- Rotation of the image produced through 90, 180 and 270 degrees
- Left hand indentation setting
- Screen dump window definition
- Colour grey scaling
- Two tone fast dump
- Special colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered dumps
- User port switched dumps

What does the independent press say!

Practical Electronics, May 1985
"The Dump Out 3 ROM from Watford Electronics represents one of the most sophisticated types of printer dump utilities available for the BBC Micro . . .".

"an extremely sophisticated and powerful dump utility".

"VERDICT – Dump Out 3 ROM has all the facilities which you are ever likely to need for producing printer dumps. The facilities available work extremely well and if printer dumps are something which you require, then this ROM can be recommended to help you to get the best out of your dot matrix printer".

The Micro User Feb. 1985.
"Well, here is that winner"!

"provides) some rather sophisticated screen dumps. Producing high resolution paper copies of graphic screens in any (graphics) mode will be the major reason for buying this ROM, and this is where Dump Out 3 performs PAR EXCELLENCE". (Our capitals for their italics.)

"The versatility of ßGIMAGE (the graphics dump command) when using these parameters is amazing. Pictures of almost any size, shape, contrast or distortion may be produced without the need for a reducing photocopier or trick photography".

"Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC micro. It is easy to use yet highly versatile, and caters for all BBC screen modes in multitone high resolution printing. Whole, partial, rotated and scaled screens may be dumped to almost any BBC compatible dot matrix printer (see our list at the end of this advert). At £25 it must represent excellent value for money and surely cannot be beaten".

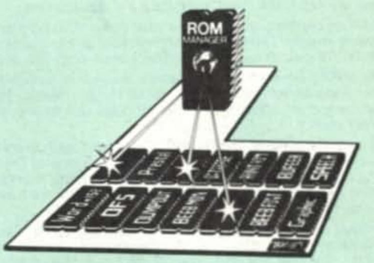
Designed for use with the following printers:

GLP, GP80/100/250, CANNON, STAR, KAGA/ TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, M1009, NEC PC8023, DMP100/200/ 400, Panasonic KX1080, Mannesman Tally etc.

Price including comprehensive manual

£25

ROM MANAGER



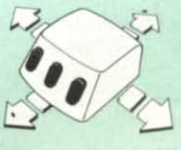
Probably the most powerful way of expanding the BBC micro is from the use of Sideways ROMs. One problem faced by the avid ROM collector is that of ROM command clashes. The solution is very simple in the form of the ROM that "Provides comprehensive management of all your installed ROMs". (Quote from BEEBUG November '84.)

Basically, ROM Manager offers you the ability to turn off any installed ROM, or to send any * command to any specific installed ROM. It is said that imitation is the sincerest form of flattery – Acorn's BBC Plus features many of the abilities of this powerful ROM.

Many more facilities available.

SPECIAL OFFER £20

THE AMX MOUSE



Now supplied with the NEW SUPERART Software ROM & Disc at no extra cost.

ONLY: £63 (carr £1.50)

We are giving away, absolutely **FREE,** our popular Colour Art software package worth **£15** with every AMX Mouse package purchased from us.

AMX DESK Package	£19.00
AMX UTILITY Package	£11.00
AMX SUPERART Package	£42
AMX PAGE-MAKER Pack Best desk-top publishing software. Works with keyboard, joystick and AMX Mouse	£32
AMX 3D ZICON Disc	£19
AMX Database Disc	£19
AMX XAM Educational	£19
AMX MAX(A gem of desktop (ROM)	£17

RB2 MARCONI TRACKER BALL

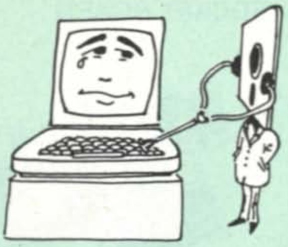
This popular unit is supplied complete with software.

Price: **£50**

FLEET STREET EDITOR

Software pack **£35**

DIAGNOSTICS DISC



The BBC micro is a very complex machine and thus diagnosing a fault can be very difficult. Until now, the only way to discover the nature of a fault was either to find a competent friend with a large degree of patience or to find your nearest dealer and pay him to find out what is wrong.

At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.

The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:

RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.

This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

BBC Publication's Popular Educational Software

● Maths with a Story 1 (Cassette). 4 primary level maths programs	£10.95
● Maths with a Story 2 (Cassette) 4 further maths programs	£10.95
● Picture Craft (Disc) 6 - 14 age group. Pack consists of flexible geometrical design & colouring programs	£19.95
● WAVES: Science Topics (Disc) CSC O Level Physics program.	£14.95
● RELATIONSHIP: Science (Disc) O Level Biology program.	£14.95
● BONDING: Science (Disc) O Level Chemistry program.	£14.95
● ELECTROMAGNETIC SPECTRUM (8 Discs) O Level program.	£14.95
● ELECTRONICS IN ACTION (Disc) O Level program	£14.95
● NEWTON & THE SPACE SHUTTLE (Disc) O Level program.	£20
● ECOLOGY (Disc) O Level program.	£20
● POLYMERS (Disc) O Level program.	£20
● Clasification & Periodic Table O Level. The suite is supplied with its own database of chemical elements which can be classified according to your own rule.	£20
● FOOD & POPULATION (Disc) O Level program.	£20
● MICROTECHNOLOGY (Cassette) O Level program.	£6.95
● A VOUS LA FRANCE (2 Cassettes) A French language home study aid.	£17
● DEUTSCH DIREKT! (Disc & Audio Cassette)	£20

TED

The Teletext Editor Package for serious users

TED is the brand new package from Watford Electronics for the editing and creation of teletext (Mode 7) screens and displays. TED is ideal for anyone wanting to create their own Mode 7 pictures (such as game title pages), designing animated displays for shop windows, exhibitions, classrooms, etc. TED is also probably the most powerful Prestel screen editor you will ever come across.

Supplied on a special 32k package, full facilities are providing for manipulating the screen, including easy to use pixel manipulation; line, column and block buffering and copying; left and right margins; large text in a variety of different fonts (contained within the ROM device); various borders and effects templates (contained within the ROM device); line and column insertion and deletion; easy to use graphics line drawing. Those are some of the features of editor itself. In addition to this, TED contains routines for taking a number of Teletext screens and creating them into an animated sequence, with user selectable display times, repeats on a group of shows, various entry methods (how the picture is put onto the screen), routing selection (both predefined and keyboard specific), chaining of other shows, etc. Scrolls treat the Teletext sequence as a very long page with a window onto it. Supplied complete with a comprehensive manual. There are many more facilities not mentioned here, so write in for a comprehensive leaflet; you'll wonder how you managed without TED.

Price: £35

ROM-SPELL

"way ahead of any competition"

ENGLISH DICTIONARY
ROM SPELL

ROM-SPELL is probably THE most advanced and fastest spelling checker available for the BBC Micro. Printed below are some extracts from a recent independent review (A&B Computing Nov. '85), which we feel sure will convince you that this is THE only spelling checker worth considering.

"The editing system is very neat and simple, instead of replying to queries and beeps all of the time . . ."

"The other feature which places ROM-SPELL way in front of any competition is the ability to examine the user dictionary, so any spelling mistakes that have found themselves on the disc can be examined and taken out if necessary".

". . . that it is compatible with many of the popular word processors on the market is a good indication that ROM-SPELL is going to be a very popular product indeed".

". . . ROM-SPELL is by far the best spelling checker for the unexpanded BBC B (with or without word processor). It boasts features which are hard to find on conventional spellcheckers on CP-M and MSDOS, namely Spellstar and has a speed-performance ratio of roughly the same as its CP/M cousin. The difference is that the CP/M version would cost the best part of £500".

". . . and with such vital house keeping features as an ambiguous word checker, the ability to edit the user dictionary, a comprehensive manual that is both easy to read and actually ENJOYABLE to learn from, . . . I feel confident that ROM-SPELL will woo the word processing public with no problems at all".

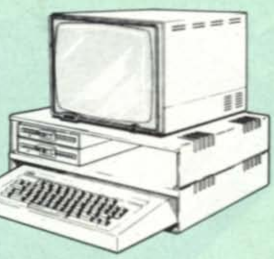
Compatible with: View, Wordwise & Wordwise +.

Don't settle for less, Buy the best.

£25

(Not compatible with 1770 DFS)
(Please state 40 or 80 track disc)

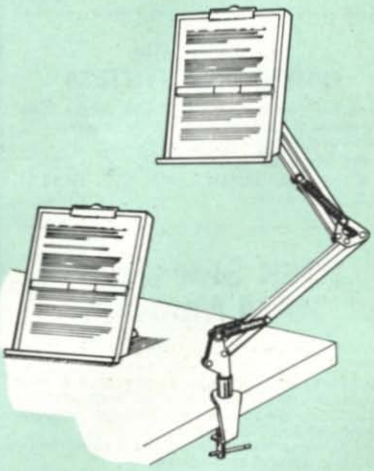
PLINTHS FOR BBC MICRO, MASTER & PRINTERS



Protect your computer from the weight and heat of your monitor. The BBC micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and monitor, whilst the double height version provides enough room for our stacked or side-by-side dual disc drives or TORCH Disc pack, to be placed in the centre section. If you use our stacked drives, the remaining space can be used for further peripherals e.g. Speech Synthesizer, EPROM programmer or simply stationery. The computer slides neatly in to the lower section allowing easy access to remove the lid. The printer plinth is equally sturdy but without the cooling slots. It allows for access to the paper from the front as well as from the rear, (a facility not often thought of in similar products) if the paper is located beneath the plinth. This is a very convenient way to work especially if your work area is not deep enough to take the printer and paper separately.

SINGLE BBC PLINTH	**£11** (carr. £1.50)
DOUBLE BBC PLINTH	**£20** (carr. £2.00)
PRINTER PLINTH	**£10** (carr. £1.50)
SINGLE MASTER PLINTH	**£14** (carr £1.50)
DOUBLE MASTER PLINTH	**£25** (carr £2.00)

COPY HOLDERS



How often have you been about to type hand written notes into your computer when you find that there's nowhere to rest the paper or that your notes are resting at the wrong angle to read the type? Whether the notes be your latest program or the draft of a new trilogy, the new Manuscript Holders from Watford are superb for holding your paper at the ideal height and angle to allow you read and type in ease and comfort.

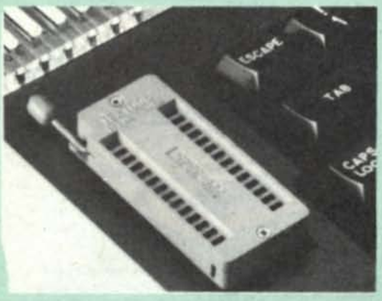
Available in 2 versions, desk resting and shelf clamping versions, these two units hold your paper firmly by means of a magnetic rul er and a clip grip.

Amazing value at only
Desk Top **£10** (carr. £2)
Angle poise **£14** (carr. £3)

All prices in this advert are exclusive of VAT.

Continued →

SIDEWAYS ZIF SOCKET



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.

- The low profile of the socket allows unrestricted access to the Keyboard.

- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.

- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for all professionals and Hobbyists alike.)

- BBC, B+ and Master compatible.

ONLY **£15** (carr £2)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack.

● Complete System	**£11**
● Spare Cartridges	**£2.50**
● Spare Rack	**£1.50**

16K Sideways RAM Modules

Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.
Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances).
- Read protection (allows recovery from ROM crashes).
- Compact construction.
- May be fitted in systems even with a ROM board.
- Multiple units may be fitted, even with a ROM board.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

Only: **£29** (carr £2)

Optional extras

READ and WRITE protect Switches **£2** each
Battery for Battery Backup **£3**

16K DISC RAM

Unlike other RAM boards, this revolutionary, battery backed up, write protectable 16K sideways RAM board allows you to run from disc every sideways ROM available.

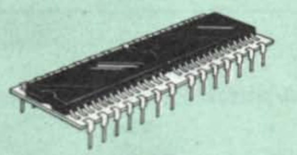
Features available are:

- No soldering or modifications to BBC micro necessary.
- Plugs into normal ROM socket fitting neatly under the keyboard allowing room for other add-ons.
- Easy to use. Comes with disk based software to SAVE and LOAD ROMs. Allows you to make backup copies of your ROMs.
- Disk software can be copied onto other discs when disc is full.
- No messy plugging and unplugging of your ROMs. Simply Load the one you want into DISC RAM.
- Ideal for Professional users to develop ROMs. Backup facility allows testing of final versions without using EPROMs.
- The switch provided allows backup and write protection to be switched off externally.
- Can also be used as 16K printer buffer RAM in conjunction with our Buffer & Backup ROM.

New Low Price: £32 (carr £2)

P.S. 16K DISC RAM Board is not designed to work in conjunction with a Sideways ROM Board.

SOLID STATE 16K SIDEWAYS RAM



This new unit from Watford, which utilises the latest in Static RAM technology, offers 16k of easy-fit sideways RAM in a very compact unit with a footprint no larger than a standard 28pin EPROM. With only a single flying lead terminating in a mini hook-on probe, to fit, (no soldering required) this compact unit works with any BBC Micro with or without a ROM board. ***Compatible with BBC B Plus.*** Like our other 16K RAM Modules, this unit is very simple to fit.

Only **£28** (carr 2)

Supplied complete with comprehensive software on Disc, Operating and fitting instructions.

Do you find the 16K Sideways RAM Units confusing? If so, we have compiled this quick questionnaire to help YOU decide which is the best one for you. If the answer to any of the questions is yes, then use the index number to select from the boards below. Options in brackets indicate possible secondary choices.

Do you require:

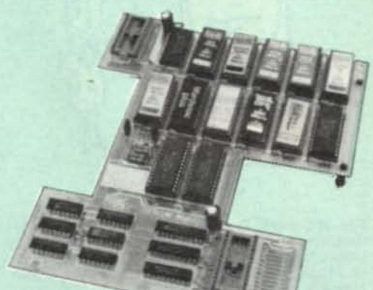
- Sideways RAM for a BBC B+ Choose 1, 2 or 3.
- Sideways RAM for the B+? Choose 3.
- A small, basic module? Choose 3.
- A sideways RAM module for a ROM board? Choose 1 or 3.
- An easy to use utilities disc[Choose 1, 2 or 3.
- More than one module installed at once? Choose 1 or 3.
- To use sideways RAM as a printer buffer? Choose 1 or 3.
- Battery Backup? Choose (1) or 2.
- Write protect for RAM (makes ROM look like RAM)? Choose (1) or 2.
- Read protect (allows recovery from crashes)? Choose 1.

Key:
1) 16k Sideways RAM Module
2) 16k Disc RAM
3) Solid State 16k Sideways RAM

GRAPH PAD 2

Supplied complete with Software
£60 (Carr. £3)

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



In the May 1986 Micro User's independent review, the writer concludes, "The board has been well laid out. Its position is much better than others – not over the HOT RAM chips and further away from the disc controller area". "I give the solderless ROM board the thumbs up and wish it success".

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16.

Unlike our competitors inferior boards, the ONLY upgrade required for fitting battery backup to the Watford Solderless ROM board (all Watford ROM boards, actually) is the fitting of the battery itself. (No other expensive components are required.)

- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish") allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £32
Battery backup fitted **£36**
(carriage £2)

NEW

The BBC B+ Micro ROM EXPANSION BOARD

Specially designed for all BBC Plus users, this board sits in an external box, and will accept either 10 off 16k EPROMs, OR 10 off 32k EPROMs.

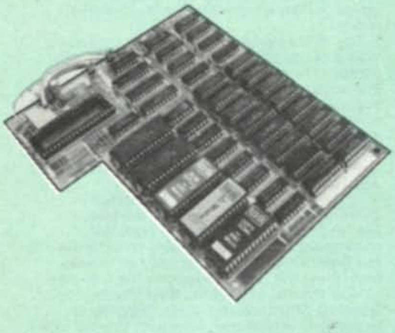
With the 32k EPROMs, only 5 can be 'online' at once (that's all the B+ can address, as each chip 'holds' two normal sockets worth), but you can swap between the two banks if necessary. With the 16k EPROMs, you can obviously address them all at once. An extra card can be added to permit 2 banks of 10 EPROMs to be used (again with only one bank available at once).

The ROM box, which has its own mains power supply, and connects to the BBC Plus via a specially designed card (which is a buffered card for your peace of mind) permits easy access to the EPROMs via the hinged lid. NO soldering is required for this board.

£79 (carr £2)

Watford ROM/RAM CARD

A must for all serious users



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
- No User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Firm mounting in BBC micro.
- Compatible with all BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- Accepts any ROM.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROM-SPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

Please write in for further details.

INTRODUCTORY PRICES:

ROM/RAM card with 32k dynamic RAM	***£39***
ROM/RAM card with 64k dynamic RAM	***£52***
ROM/RAM card with a massive 128k dynamic RAM	**£80**

(carriage on ROM-RAM Card £3)

OPTIONAL EXTRAS:

16k plug-in Static RAM kit	***£6***
16k Dynamic RAM for Upgrade	***£7.50***
Battery backup	***£3***
Read and Write protect switches	***£2 each***
Complete ROM-RAM board (all options installed)	***£89***

Le Modem

The MODEM from Watford

At last a professional MODEM for the BBC Micro. Unlike other 'Modem packages' this is a complete package there are no extra software costs to get 'up and running'. Of course Le MODEM is multi-standard, i.e. 300/300, 1200/75 & 75/1200 UK and BELL (USA) are all supported.

The features that make Le MODEM such good value are:

- *A complete communications terminal that transforms your BBC Micro into a very powerful World-wide data transfer system.*
- *Auto Dials, Auto answers, and is completely controlled by your micro. There are no external controls!*
- *Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY BB and more.*
- *Designed to be SIMPLE but SOPHISTICATED. To LOGON to a data base all you have to know is its TELEPHONE NUMBER, Le MODEM does the rest.*
- *Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELE-SOFTWARE to be downloaded.*
- *A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!*
- *FULLY controlled by simple '*COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!*
- *Connects to the 1MHz bus. A *AUDIO ON-OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.*
- *Completely self contained with internal mains power supply. (Even a free mains plug is fitted!) A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.*
- *Packaged in such as way that you need nothing else except a BBC Micro to communicate with computers all over the world.*
- ***FREE Registration to MicroLink.***
- *BT Approval applied for.*

(When ordering, please specify the version required, (BBC or Master)

SPECIAL OFFER

Price: **£74**
(carr £3)

(Price includes, Le Modem, Software ROM, Cables & Comprehensive Manual)
(Write in for further details)

Nightingale Modem

SPECIAL PRICE to our Customers

£99

(Price includes: Nightingale Modem, Commstar ROM pack, Cables & Comprehensive manual)

Nightingale Modem without software	**Only £87**
COMMSTAR ROM package only (P&P on modem £2.00)	**£29**
Auto Dial-Auto Answer Board (non BABT)	**£48**
Auto Dial Utilities Disc	**£9.50**
OBBS Bulletin Software	**£20.00**

APOLLO

The NEW Modem from Watford

Following numerous requests from you, our discerning customers for an APPROVED, Low Cost & High Performance modem with Auto Dial & Auto Answer facilities as standard) we bring you the versatile APOLLO Modem. Just compare the features and look at the price (which incidentally includes the cost of the Software, manual and BBC connecting cable). We are sure you will agree that Watford Electronics in their traditional way are giving you a super 'value for money' deal.

Just look at these features:

- V21 for Bulletin boards, Microlink, Telecom Gold, etc.
- V23 for Prestel, Home Banking, and other Viewdata services.
- Reverse V23 allows User run Viewdata service.
- 1200-1200 half duplex for communications.
- XMODEM, HEX and ASCII file transmission.
- Auto Dial of given 'phone number.
- Auto Answer for User's Bulletin Board.
- 80 column terminal with split screen facility.
- Prestel text screen dump.
- Fully BABT approved.
- **FREE Registration to MicroLink.**

The Apollo is attractively finished in matt black. It opens the doors to world communication to both, the Hobbyist and the Professionals alike. With baud rates varying from 300/300 Originate and Answer, 1200/75 and 75/1200 full duplex and 1200/1200 half duplex, virtually all the popular tele-services can be accessed. A comprehensive Comms ROM oversees the use of the APOLLO, providing simple commands for all the software controlled facilities. APOLLO is an ideal modem for both the first time buyer and the seasoned user. Join the Telecommunications Revolution – Buy a Watford APOLLO!

Special Launch Price: **£75**
(Carr £3)
(Write in for full specification)

BT TELEPHONE CONNECTORS

LJU 1/4A Mini Line Master	**£4.50**
LJU 1/6A Mini Line Slave	**£3.00**
LJU 2/4A Line Master	**£4.00**
LJU 2/6A Line Slave	**£2.50**
LJU 3/4A Flush Master	**£3.95**
LJU 3/6A Flush Slave	**£2.75**
LJU 10/3A Dual Splitter	**£5.50**
4 Way BT Plug	**£0.75**

Versatile **BEEB SPEECH SYNTHESISER** Unit

Beeb Speech Synthesiser

The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £32 (carr £2)

Continued →

COMPUTER CONCEPT'S ROMS

ACCELERATOR	£48
CARETAKER Basic Utility	£25
DISC DOCTOR	£28
Graphics ROM	£23
TERMI	£25
COMMUNICATOR	£49
SPEECH ROM	£24
Printmaster	£24

Wordwise

£24

Wordwise plus

WORDWISE PLUS
£40

We are giving away absolutely **FREE,** the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear text-segment area.
- BBC B, B+ and Master compatible.

Only **£24**

(N.B. Word Aid requires a Disc Interface in your Micro)

HI-WORDWISE-PLUS

Supplied on disc. This version requires a WORDWISE-PLUS ROM to be present in the machine. It gives up to 44k of text space on the 6502 2nd processor.

£5

Inter SHEET ONLY £37

INTER-CHART

ONLY: £26

Inter-WORD

Only: £42

Special Discount price for the existing Wordwise Plus owners. Simply quote your reg. number and pay.

Only: **£39**

All Prices Exclusive of VAT

VIEW

VIEW WORDPROCESSOR 2.1	£37

VIEW 3.0 ROM

Price: Only **£54**

HI-VIEW

A special version of VIEW designed for use with 6502 2nd Processor. Available on disc, it offers 47K of text memory.

£36

VIEWSHEET (Acornsoft)	**£37**
VIEWSTORE	**£37**
VIEWSPELL with 80 track disc	**£29**
VIEWPLOT Disc	**£22**
VIEW-INDEX	**£12**

Watford's own Sophisticated VIEW PRINTER DRIVER for Epson FX80 & KAGA KP

Only £10

VIEW DRIVERS FOR JUKI & BROTHER HR15 PRINTERS

Only £10

VIEW-VIEW SHEET PRINTER DRIVER for SILVER REED

(Officially approved by Silver Reed)

Only: £10

MINI OFFICE II (disc)	**£14.50**

REPLICA 3

This new improved REPLICA 3 from Clares is a very powerful disc based TAPE to DISC Utility. It now transfers even more programs than ever before. Replica 3 will not work with all programs but then neither will anything else. 30,000 Replicas have been sold to date. It has to be good.

£13 (40 or 80 track)

النور

ARABIC ROM
for the BBC Micro

The ALNOOR ARABIC ROM converts your BBC into a bilingual computer. New keytops provide both English and Arabic symbols. Two sets of Arabic symbols are provided for use in either context sensitive or insensitive operation.

20, 40 and 80 column operation. Compatible with ASMO (449). English-Arabic printer interface software. Numeric entry from either left or right of number. Communications software to send or receive 7 or 8 bit data.

Different shapes of Vowels (e.g. Shadda, Fatha, etc). Different shapes of Hamza. Full English and Arabic character sets with all special characters.

£85

(Price includes Alnoor ROM, Operating Manuals & a full set of Arabic/English Keytops)

VIEW PRINTER DRIVER ROM

(Professional facilities for demanding users)

View is a powerful word processor, but until now has seriously lacked in terms of printer support. With the launch of our Printer Driver ROM, which includes an extremely powerful and easy to use Printer Driver Generator, View users can find themselves in the realms of advanced word processing only at a small outlay.

The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, FX, LX, JX80 range, HI80, KP810/910, PW1080, JP101, HR15, M1009, GLP, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redefinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute * command when printing.

Other features include a very powerful on screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips. (Write in for a detailed leaflet).

Price: Only £33

CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234-33383

THE INVESTIGATOR

This sophisticated Utility program on disc, enables you to make security back-up copies of most of your valuable Disc Software. Makes full use of all 8271 (will not run with double density DFSs) facilities to discover the precise format of your protected disc so that an exact copy can be produced. Supplied with detailed instructions. Please specify 40 or 80 track disc when ordering.

Only **£20**

ROMAS

THE CROSS ASSEMBLER AND MACRO EDITOR FOR SERIOUS PROGRAMMERS!

ROMAS is a carefully designed, sophisticated yet simple to use, development system for serious assembly language programmers. Using the BBC as the development system, you can choose your target system from the following processors:

6502, 65C02, Z80, 8085, 8041, 6809 and Z8
P.S. This includes the Acorn 6502 & Z80.

A give away at . . . **Only £29**

Please specify 40 or 80 track disc when ordering.

ARIES CORNER

Aries B-32 Shadow RAM Card

18 months of intensive research and development have produced a worthy successor to the widely acclaimed Aries-B20: the revolutionary Aries-B32. This 'second generation' expansion board features 32k of RAM and a 16k ROM socket.

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Comal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved *FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the processor socket on your BBC micro – no flying leads to connect and no soldering. Provision of the on-board ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

Price: B-32 **£80** (carr. £2)

Aries B-12 Sideways ROM Board

This board is extremely well made, simple to install, reliable when fully loaded and compatible with the Aries B-20 and the Aries B-32. For the business user or educationalist, the compact and secure internal fitting is ideal, with the ROM board tucked neatly inside the lid where it will not cause overheating problems. The serious software developer and the hobbyist may prefer to mount the board externally, giving instant access to the sockets for experimental purposes. A zero-insertion force (ZIF) socket may be fitted to the board to enhance this mode of operation.

The B12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

The B12 system consists of two parts: a large detachable 'mother board' which carries the extension ROM sockets and a small 'base board' on a short ribbon cable, which plugs into the existing sideways ROM sockets. This two-board design eliminates the reliability problems previously associated with some other ribbon-cable based systems.

If you do not have an B32 or B20, a small adaptor module (the Aries B-12C) is available at a nominal cost. The 6264 static RAM chips used to provide the sideways RAM are advertised elsewhere in our advert.

Price:
Aries B-12 **£40.** Aries B-12C **£5**

THE ARIES RANGE HARDWARE REQUIREMENTS

Aries B-32 & BBC B, MOS 1.20, hardware plugs into CPU socket.
Aries B-12 & BBC B, MOS 1.20, hardware plugs into all four sideways ROM sockets and connects to the B32 or the B20. The adaptor Aries B-12C module is necessary where these are not fitted.
Aries B-488 BBC B, MOS 1.20, Hardware plugs into 1MHz Bus.

ARIES B-488 IEEE-488 INTERFACE UNIT

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB' or 'HP-IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

Aries B-488 Unit: **£238** (Carr £3)

OFFICE MASTER

Office Master

CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trail balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

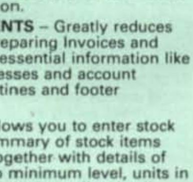
INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only **£21**

(Cassette or Disc)

OFFICE MATE



- DATABASE
- BEEBCALC SPREADSHEET
- BEEBPLOT GRAPHICS
- WORD PROCESSOR

DATABASE – Set up a computerised "card index" system and add records/data to the file your way. Features include search, sort, mathematical calculations, printer routines, data summaries, etc.

SPREADSHEET – Offers a wide range of invaluable calculation and editing features. Beebplot will take files created by Beebcalc to provide data portrayal in graph, histogram or pie chart format.

BEEBPLOT – Provides an easily assimilated visual representation of numerical data.

WORDPROCESSOR – Provides many routines found in large and expensive packages.

OFFICE MATE Only £10

(Cassette or Disc)

THE EUREKA CARD

(The Unique RAM Expansion System)

The Eureka Card is Watford's latest and most sophisticated RAM expansion system. Using advanced PAL based technology this card is a breakthrough in RAM systems for the BBC micro. The Eureka Card provides the user with around 58K of free memory in Basic, VIEW and WORDWISE PLUS. You also get Shadow RAM from within the active language. No other RAM expansion system can match that!

Load up to 58K long Basic programs. Texts in VIEW and WORDWISE PLUS up to 58K as well. This with absolutely NO loss of speed in accessing your text or program. Eureka consists of a card containing 64K of program memory, two parallel banks of sideways RAM and some extremely complex switching circuitry. This is all controlled by Eureka's highly sofisticated software supplied in ROM. Designed to a very high specification, this board is fully buffered to give reliable operation under virtually any circumstances.

The Eureka board plugs into the 6502 socket and has NO messy flying leads. It is compatible with many other products from Watford, such as our Solderless ROM Board and our ROM/RAM Board. All in all, the Eureka Card is an amazing board. Jump into the age of serious data processing with a Eureka Card! Please write in for further details 'on advantages the Eureka can offer you'.

Introductory price: Only **£89** (carr £3)

(P.S. Eureka is only suitable for a standard model B; it normally replaces any Shadow RAM cards present. Some speed degredation does occur with filing system access. Eureka cannot be used at the same time as a second processor).

BEEBMON

The most powerful machine code monitor for the BBC Micro **£24.**

MEGABUFFER 256

This new Megabuffer 356 from Watford is a full featured 256K Printer Buffer. It allows the computer to print 256,000 character in a short time thus freeing the computer very quickly. In short it makes light work of printing large documents, screen dumps, etc. It is extremely simple to connect. The features are:

- Low Cost, High performance.
- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatibility with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in test unit for both the buffer & your printer.

In conclusion it can safely be said that MEGABUFFER 256 is the ultimate printer Buffer for both the amateur and professional user.

Only £99 (carr £2)

L.B.O. Rom

Life & Business Organiser

Use LBO to organise your life from today until 1999! It can handle literally hundreds of multi-line messages, as many as you are ever likely to need. Despite the very wide range of facilities offered, this professional program is VERY easy to use and requires absolutely NO knowledge of computers. A vital aid to your everyday life, LBO is GREAT FUN TO USE!

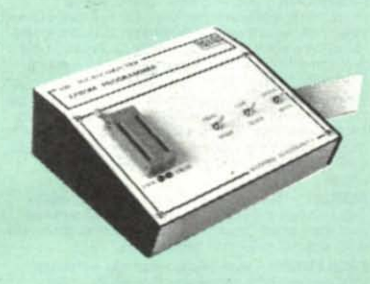
Price only: £17

Continued ⟶

BOOKS (No VAT on Books)

15 Hrs Word Processor Using BBC	£3.95
30 Hour BASIC (BBC Micro)	£7.95
40 Best machine Code Routines	£7.95
6502 Assembly Language Program	£19.95
6502 Application	£11.95
6502 Assembly Lang. Subroutines	£19.95
6502 Development System	£7.50
6502 Machine Code for Humans	£7.95
6502 Reference Guide	£9.95
68000 Assembly Lang. Programming	£19.95
68000 Machine Code Programming	£13.00
68000 Programming the	£22.95
6809, Programming the	£16.95
Art of Music Graphics	£14.95
A User Guide to Wordwise Plus	£9.95
A Young persons Guide to BBC Basic	£5.95
Advanced Disc User Guide	£16.95
Advanced BASIC ROM User Guide	£9.95
Advanced User Guide for BBC	£15.95
Advanced Graphics with BBC	£9.95
Assembly Language Programming on BBC Micro	£11.50
Adventure into BBC BASIC	£6.95
Applied Assembly Lang. for BBC	£9.95
Assembler Routines for the 6502	£7.95
Assembly Language Programming FOR the BBC Micro	£8.95
Assembly Language Programming on the BBC & Electron	£8.95
Basic ROM User Guide	£11.95
Basic User Guide for BBC Micro	£10.00
BBC B Compendium	£5.95
BBC B+ User Guide	£14.95
BBC BASIC for Beginners	£7.95
BBC Forth	£7.50
BBC Hardware Projects	£8.95
BBC Micro & the small Business	£5.75
BBC Micro ROM Book	£10.95
BBC Master 128 High Flyer	£10.95
BBC Micro Advanced Ref. Guide	£10.95
BBC Micro Disc Companion	£8.95
BBC Micro File Handling on	£6.95
BBC User Guide	£10.00
BBC Software Projects	£6.95
BBC Wordprocessor Beginners Guide	£7.95
BBC Within the Micro	£13.95
BCPL User Guide	£14
Complete FORTH	£6.95
CP-M-86 User's Guide	£19.95
CP-M Bible	£16.50
CP-M Handbook with MPM	£9.95
CP-M Plus Handbook	£13.95
CP-M Soul of	£16.50
CP-M The software BUS	£8.95
Creative graphics on BBC Micro	£7.50
Disc Drive Projects for Micros	£5.45
DISC FILING SYSTEM (DFS) Operating Manual for BBC	£6.95
Disc Programming Techniques	£9.95
Disc System for the BBC Micro	£6.95
Exploring FORTH	£6.95
FORTH on the BBC Micro	£7.50
Functional Forth for the BBC Micro	£5.95
Guide to BBC ROMs	£9.95
Graphs & Charts on BBC Micro	£7.50
Hackers Handbook - New	£6.95
Interfacing & Robotics on BBC	£15.95
Into View	£4.50
Introduction to COMAL	£9.50
Introduction to LOGO	£6.95
Introducing 'C'	£9.95
Introducing LOGO	£5.95
Introduction to FORTH	£8.95
Introduction to PASCAL	£17.95
ISO-PASCAL Reference Manual	£9.95
LISP 2nd Edition	£14.95
LISP, A Beginners Guide to	£10.95
LISP the Language of Artificial Intelligence	£9.95
Logo Programming	£9.95
Mysteries of DISC DRIVES and DFS REVEALED	**£5.95**
Mastering Assembly Code	£8.95
Mastering CP-M	£17.95
Mastering Music	£6.95
Mastering the Disc Drive	£7.95
Master Advance Reference Manual	£19.95
Master Reference Manual Part 1	£14.00
Master Reference Manual Part 2	£14.00
Micronet Handbook	£6.95
Points of View	£6.95
Programming the 6502	£16.95
Programming the Z80	£19.95
Structured Basic	£7.95
Structured Prog. with BBC BASIC	£6.50
The Complete FORTH	£6.95
The Epson FX-KAGA PRINTER Commands REVEALED	**£5.95**
Turtle Graphics on BBC Micro	£7.50
Using Floppy Discs with BBC Micro	£5.95
View 3.0 User Guide	£10
View Guide	£4.50
Viewsheet User Guide	£10
Viewstore User Guide	£10
Using BBC Basic	£4.95
Wordprocessing BBC Beginners Guide	£7.95
Wordstar & CP/M made easy	£7.45
Wordwise + A User Guide	£9.95
Z80 Applications	£15.95
Z80 Assembly Language Programming	£19.95
Z80 Reference Guide	£9.95

EPROM PROGRAMMER



The Watford Electronics' EPROM programmer for the BBC micro is a high quality self contained package. Programs all popular EPROMs from 2K to 16K: 2716, 2516, 2532, 2564, 2764 and 27128. All manufacturers' specifications have been followed to program EPROMs at the correct speed – wrong timings could destroy your EPROMs. The unit has its own power supply so does not put heavy loads on the BBC power supply as do some other units. Connects directly to the 1MHz bus following all Acorn recommendations on addressing and bus loadings.

SOFTWARE PACKAGE
The software is supplied on an EPROM which plugs into the Micro and is instantly available with a single command (no time wasting as on Cassette-disc loading). It is a fully purpose designed and ingegrated package to simplify ROM development. The system is menu driven with many prompts to avoid any accidents.

Software facilities include:
Load File – Save File – Down Load EPROM – Program EPROM – Verify – Blank Check – Editing of memory contents prior to programming.
Also included is an automatic system to allow Basic programs to be put in EPROM and accessed through the *ROM filing system. More than one program may be put in an EPROM. All these facilities and more are explained in the comprehensive and clear 15 page manual.

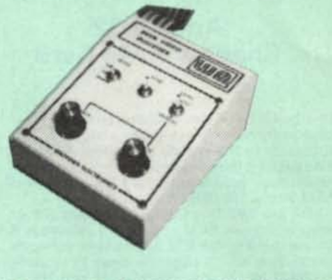
SPECIAL OFFER £69 (£3 carr.)

TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

- ● **ERASER EB** – Standard version erases up to 16 chips. **£28** (carr £2)
- ● **ERASER GT** – Deluxe version erases up to 18 chips. Has automatic safety cut-off to switch off the UV lamp when opened. **£30** (carr £2)
- ● Spare UV tubes. **£9**

BEEB
VIDEO DIGITISER



Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.

This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.

Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem.

The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

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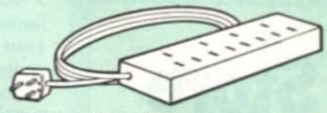

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NEWSLETTER

Store deal boosts Email

A MAJOR breakthrough in electronic mail is being forecast as a result of a tie-up between MicroLink and a nationwide dataservice pioneered by the Debenhams stores group.

It means there are now 120 more ways to access MicroLink at local call rate.

Until now, in order to send a message through MicroLink, a subscriber had to dial a London number direct or route the call through a PSS node in one of 20 towns and cities.

The new link-up means 42 more towns get a direct route to MicroLink – making a total of 120 new lines.

"Until now many people in outlying areas have hesitated about using electronic mail because of the cost of long distance calls", says Derek Meakin, head of MicroLink.

"Now that many more can access the service for the cost of a local phone call, we expect the demand for our service to increase dramatically".

MP's lifeline

A MAJOR problem for Parliamentarians who represent far-flung constituencies is communication.

One man who has found a solution is Roy Beggs, Ulster Unionist MP for Antrim East.

He uses MicroLink's telex service to transmit messages to other MPs, and to maintain an information flow between his Northern Ireland base and Westminster.

But the former secondary school vice-principal would like to see MicroLink's technology used more fully in the political arena.

His constituency office is equipped with a micro and modem and eventually he would like to see it linked by electronic mail to both his own and the Ulster Unionist Party office in London.

His engineering graduate son, Roy Beggs jnr, is teaching both him and a constituency research assistant how to use the latest information technology in readiness for the day when Email becomes the favoured medium of communication for everyone at Westminster.

Fast help for the immigrants

WHEN a London YTS scheme suddenly collapsed Roy Tindle was one of a group of organisers who got in their cars and drove around the city desperately trying to find other places for the unlucky youngsters.

"Half the people we wanted to see were out", he said, "and a lot of our efforts were wasted as a result.

"But that was before we joined MicroLink. Today we are equipped to sort out disasters like this rapidly via telex and electronic mail".

Roy is manager of Springboard East YTS in Spitalfields, London, an area which for centuries has provided refuge for successive waves of immigrants to England.

He helps to prepare many of today's newcomers, mainly young Bengalis and Vietnamese, for jobs in City offices by training them to use computers.

"I'm convinced that electronic mail is the communications medium of the future", he said. "I use MicroLink to access educational databases and to contact prospective employers and government agencies.

"I find I get amazing response from people through MicroLink telex and Email. I can often get a situation resolved the same day instead of having to wait up to three months to do it by mail".

DARTS LINK

EACH time Eric Bristow spears a triple 20 in a televised darts tournament, or Emlyn Hughes guesses correctly on A Question of Sport, Mike Stockdale scores as well.

MicroLink subscriber Mike is boss of Paradise Management UK, the firm that supplies the electronic scoring systems for a host of televised sporting events and quiz shows.

His "one-chip micro" system controls the huge scoreboard displays that show the current state of play, which you see on your TV screens.

Mike uses MicroLink telex and electronic mail to keep in touch with his contacts at the BBC and in the darts world – and also for his other business interests.

Prizes for keyboard artistry

PROVING that MicroLink has its lighter side is a competition for subscribers with an artistic bent.

Contestants have to design a poster on their micro using only the characters, symbols and numbers on their keyboard.

Entries are sent over the system to a special poster library on the MicroLink bulletin board to which all subscribers have access.

This "exhibition of original art" will be judged by other MicroLink users whose votes will decide which five entrants will be awarded prizes for originality in an unusual medium.

YOUR chance to join MicroLink – turn to Page 55

The big SQUEEZE

John Kelk presents you with another routine to compress your programs even further

LAST month we gained speed and space in your Basic programs by removing unnecessary spaces, deleting REMs and shortening variable names.

Further progress in speed and space can be achieved if we use long multi-statement lines to replace shorter ones.

But it is not a good idea to write an original program in this way. Extremely long multi-statement lines are difficult to read and must be tediously copied in their entirety if any changes have to be made.

What is needed is a utility which will automatically compress a fully debugged original program into the smallest possible number of lines. The machine code produced by this utility does this.

A Basic target program is scanned byte by byte starting from PAGE, location &18 in page zero, and continuing until TOP-2, calculated from locations &12 and &13. In fact two scans are needed.

On the first the target program is searched for any instances where the maximum possible line compression cannot be allowed. There are seven such special cases, thankfully much less than in variable compression. These cases are shown in Table I.

It may be seen from the above that there are basically two types of special case to be catered for on the first scan. Firstly there are lines to which the next line may not be merged, such as REMs. Secondly there are lines which may not be merged on to the end of the previous line, such as DEFs.

The possibility of any of these arising inside string quotes, and hence not being applicable, is also catered for.

All lines which must not be merged on to a preceding line are identified and marked. The marking is achieved by making use of the fact that Basic line numbers are two byte numbers whose hi-byte must not exceed &7F.

Any line requiring a marker has the

REMs	No addition must be made to the end of any line containing a REM statement since any addition will be assumed by the Basic interpreter to be just part of the REMark.
*** command**	A similar situation applies when an operating system * command is encountered.
DATA	Likewise a line beginning with a DATA statement cannot be extended. Notice also that the DATA statement must be the first statement on the line. So, as well as having no statements merged on to the end of the data, the DATA line itself must not be joined to the preceding line.
IF	An IF statement must not be extended. The addition of any extra statements whose operation would not normally be affected by the IF condition would cause very odd effects.
ON ERROR	This statement must not be extended for a similar reason. But can be added to the preceeding line.
DEF	These statements will not be interpreted if DEF is not the first instruction on a line, as in the case of the DATA statement.
GOTOs	Any line referred to by a GOTO, GOSUB or RESTORE – recognised by the coded line number token &8D – must not be lost by merging it on to the end of another line.

Table I: Special cases for line compression

Turn to Page 108 ▶

```
10 REM ************************
20 REM *MULTI-LINE  COMPRESSOR*
30 REM *    By John Kelk      *
40 REM * (c) The Micro User   *
50 REM ************************
60 MODE7
70 PROCassemble
80 PRINT
90 PROCcheck
100 END
110 :
120 DEFPROCassemble
130 base1=&70:base2=&72
140 top=&74
150 linelo=&76:linehi=&77
160 yold=&78:ynew=&79
170 flag=&7A:work=&7B
180 FOR pass=0 TO 2 STEP 2
190 P%=&B00
200 [OPT pass
210 .main
220 LDA &12:SEC:SBC #2:STA top
230 LDA &13:SBC #0:STA top+1
240 LDA &18:STA base1+1
250 LDY #0:STY base1
260 STY flag
270 JSR scan1
280 LDA &18:STA base1+1:STA base2+1
290 LDY #0:STY base1:STY base2
300 JSR scan2
310 JSR end
320 RTS
330 :
340 .scan1
350 JSR checktop:BEQ endscan1
360 JSR scanline
370 LDY #0:BEQ scan1
380 .endscan1
390 RTS
400 :
410 .scanline
420 INY
430 LDX flag:BEQ nochange
440 LDX #0:STX flag
450 LDA (base1),Y
460 ORA #&80:STA (base1),Y
470 .nochange
480 INY:INY
490 .nextbyte
500 INY:LDA (base1),Y
510 CMP #13:BNE teststring
520 .nextline
530 TYA:CLC:ADC base1:STA base1
540 BCC s2
550 INC base1+1
560 .s2
570 RTS
580 .teststring
590 CMP #34:BNE testrem
600 JSR string:BEQ nextbyte
610 .testrem
620 CMP #&F4:BEQ flagline
630 .teststar
640 CMP #ASC"*":BNE testdata
650 JSR checkos:BEQ flagline
660 BNE nextbyte
670 .testdata
680 CMP #&DC:BNE testif
690 JSR markline
700 .flagline
710 INC flag
720 LDY #3:LDA (base1),Y:TAY
730 BNE nextline
740 .testif
750 CMP #&E7:BEQ flagupdate
760 .teston
770 CMP #&EE:BNE testdef
780 .flagupdate
790 INC flag:BNE nextbyte
800 .testdef
810 CMP #&DD:BNE testlinetoken
820 JSR markline:BNE nextbyte
830 .testlinetoken
840 CMP #&8D:BNE nextbyte
850 JSR linetoken
860 JMP nextbyte
870 :
880 .markline
890 STY ynew
900 LDY #1:LDA (base1),Y
910 ORA #&80:STA (base1),Y
920 LDY ynew
930 RTS
940 :
950 .string
960 INY:LDA (base1),Y
970 CMP #13:BEQ nextline
980 CMP #34:BNE string
990 RTS
1000 :
1010 .checkos
1020 CPY #4:BEQ endcheckos
1030 STY yold:DEY
1040 .c1
1050 LDA (base1),Y
1060 CMP #58:BEQ c2
1070 CMP #32:BNE c2
1080 DEY:CPY #3:BNE c1
1090 .c2
1100 PHP:LDY yold:PLP
1110 .endcheckos
1120 RTS
1130 :
1140 .linetoken
1150 INY:LDA(base1),Y:STA work
1160 AND #&30:ASL A:ASL A:STA work+1
1170 INY:LDA(base1),Y
1180 EOR work+1:STA linelo
1190 LDA work
1200 ASL A:ASL A:ASL A:ASL A:STA work+1
1210 INY:LDA (base1),Y
1220 EOR work+1:ORA #&80:STA linehi
1230 LDA base1:STA base2
1240 LDA base1+1:STA base2+1
1250 STY yold:LDY #2
1260 LDA (base1),Y:CMP linelo
1270 DEY:LDA (base1),Y:ORA #&80
1280 SBC linehi:BCC no
1290 LDA &18:STA base1+1
1300 DEY:STY base1
1310 .match
1320 LDY #2
1330 LDA (base1),Y:CMP linelo:BNE no
1340 DEY:LDA (base1),Y:ORA #&80
1350 CMP linehi:BEQ yes
1360 .no
1370 LDY #3:LDA (base1),Y:TAY
1380 JSR nextline:JMP match
1390 .yes
1400 STA (base1),Y
1410 LDY yold
1420 LDA base2:STA base1
1430 LDA base2+1:STA base1+1
1440 RTS
1450 :
1460 .scan2
1470 JSR checktop:BNE linebuild
1480 RTS
1490 .linebuild
```

This is one of hundreds of programs now available FREE for downloading on MicroLink

```
1500 LDY #0:STY ynew:LDA (base1),Y
1510 JSR update
1520 AND #&7F
1530 JSR update:JSR update
1540 .code
1550 JSR wholeline
1560 JSR checktop:BEQ endline
1570 LDY #1:LDA (base1),Y
1580 BMI stopline
1590 LDY #3:LDA (base1),Y
1600 SEC:SBC #4:ADC ynew:BCS stopline
1610 LDA #ASC":":BNE code
1620 .stopline
1630 JSR endline:JMP scan2
1640 :
1650 .endline
1660 LDA ynew:LDY #3:STA (base2),Y
1670 CLC:ADC base2:STA base2:BCC e1
1680 INC base2+1
1690 .e1
1700 RTS
1710 :
```

◀ ***From Page 107***

hi-byte of its line number ORed with &80. This creates a negative byte which is tested for in the second scan and which may be easily restored by ANDing with &7F.

Complications

The most complicated possibility in the first scan is the dreaded GOTO. Here the line to be marked need not necessarily be the current or next line, but may be any distance forward or backwards in the program. Any of these encountered are dealt with immediately in subroutine *linetoken*.

The line number, held in the three bytes after the token &8D, is decoded into the normal hi-byte, lo-byte format and a check is made on whether the line to be marked is before or after the current line.

The line to be marked is then found by searching either from the program start up to the current line or from the next line onwards to the end.

Note that no error checking is done – it is assumed that the line does indeed exist, as it must in a fully debugged program. Also in a utility of this nature it is impossible to cater for computed GOTOs such as:

```
GOTO linenumber%
```

as these do not involve the token &8D.

It must be said, however, that if the existence of GOTOs in a program is bad computed GOTOs are much rarer and worse.

When all problem lines have been marked the program pointers in *base1* and *base2* are reset to the start of the target program and the second scan is begun.

This carries out the merging of the

```
1720 .wholeline
1730 JSR update
1740 CMP #13:BNE wholeline
1750 JMP nextline
1760 :
1770 .update
1780 INY:STY yold:LDY ynew
1790 STA (base2),Y
1800 INY:STY ynew:LDY yold
1810 LDA (base1),Y
1820 RTS
1830 :
1840 .checktop
1850 LDA base1:CMP top:BNE notequal
1860 LDA base1+1:CMP top+1
1870 .notequal
1880 RTS
1890 :
1900 .end
1910 LDY #0:LDA #&0D:STA (base2),Y
1920 INY   :LDA #&FF:STA (base2),Y
1930 TYA:SEC:ADC base2:STA &12
1940 LDA base2+1:ADC #0:STA &13
1950 RTS
1960 .fin
1970 ]:NEXT
1980 ENDPROC
1990 :
2000 DEF PROCcheck
2010 LOCAL A$,B$,A%,B%,C%,T%
2020 RESTORE 2160
2030 READ A$:A%=EVAL(A$)
2040 REPEAT
2050 READ B$:IF B$="*" GOTO 2130
2060 B%=EVAL(B$):T%=0
2070 FORJ%=A%TOB%-1:T%=T%+?J%:NEXT
2080 PRINT A$;" to ";B$;
2090 PRINTSPC(25-LEN(A$+B$));
2100 READ C%
2110 IF T%=C% PRINT"O.K." ELSE PRINT
"ERROR!"
2120 A$=B$:A%=B%
2130 UNTIL B$="*"
2140 ENDPROC
2150 :
2160 DATA main,scanline,5633
2170 DATA testdata,7581
2180 DATA markline,6677
2190 DATA linetoken,6656
2200 DATA match,7661
2210 DATA scan2,4659
2220 DATA endline,5286
2230 DATA fin,9116
2240 DATA *
```

This listing is included in this month's cassette tape offer. See order form on Page 159.

base1	Pointer to start of current Basic line in the old version of the target program.
base2	As *base1* but for the new version and as temporary storage of *base1* in subroutine *linetoken*.
top	Stores target program's end address.
linelo,linehi	Stores low and high bytes of a line number produced by the decoding of a tokenised line number after &8D.
yold, ynew	Temporarily stores the contents of the Y register.
flag	Indicates if the next line must not be merged to the current line.

Figure I: Variables

main	Initialises pointers, top, and calls scan routines.
scan1	Calls scanline for each program line.
scanline	Checks each Basic line for any of the seven special cases, ignoring text between string quotes with *base1* being updated at the end of each line.
nextline	Resets *base1* to point to the start of the next Basic line.
markline	ORs the high byte of the line number for the current line with &80 to indicate it may not be merged to the preceding line during the second scan.
string	Skips text between quotes.
checkos	Checks the possibility that a * character is the start of an operating system command. The Zero flag will be set if it is.
linetuken	Decodes a three-byte tokenised line number into its normal two-byte form, with the hi-byte ORed with &80. A search for the matching program line is then carried out and that line marked, as described in the main text
scan2	Combines lines except where the high byte has been marked. Removes markers.
endline	Resets *base2* at the end of each merge operation to point to the start of the next mega-line.
wholeline	Copies the whole of the rest of the old line to the new version.
update	Stores current byte in correct position in the new version, then loads next byte from the old version.
checktop	Compares current position in the program with the end of the program. The Zero flag is set when the end of the program is reached.
end	Stores the normal, two byte program finish (&0D, &FF) and resets TOP.

Figure II: Subroutines

lines, creating the new, shorter program over the top of the old one.

Warning!

The warning given in the previous article also applies here: As the target program is overwritten by the new version make sure that you have a copy of the original program on disc or tape before running the utility since any further program development or debugging is most easily accomplished using the original.

If a marked line is not encountered the maximum line length is 255 bytes. It is worth noting that a 255 character line created by this utility could not be typed at the keyboard or edited when created.

This is because of the internal tokenising carried out on the Basic line. The internal storage of the line is thus shorter than the expanded form shown on the screen which will have more than 255 characters and so would exceed the capacity of the keyboard buffer.

The machine code is set to execute at &B00 and is less than two pages long.

After typing in and saving the Basic program. Run it and use:

```
*SAVE COMPL B00+200
```

to save the machine code. The utility may be run on any Basic target program by *RUN COMPL or by CALL &B00 if it is already in memory.

Each line number removed results in a three byte saving: One for the start of line marked by byte &0D, two for the line number, one for the line length – and less one for the new colon which must be inserted before merging can take place.

Although COMPL will work on its own the maximum compression will be achieved if COMPV – last months variable compressor – is run first so that each line is at its minimum length. After running COMPV use OLD to reset TOP.

The target program should have no multi-statement lines with more than 130 characters to start with. Just think what would have to happen if two successive multi-statement lines, each of 130 characters were encountered.

Please do not submit compressed programs to The Micro User *because they cannot be typed in correctly. A compressed line will usually exceed 240 characters when printed in full and the input buffer will not be able to hold all the line.*

■

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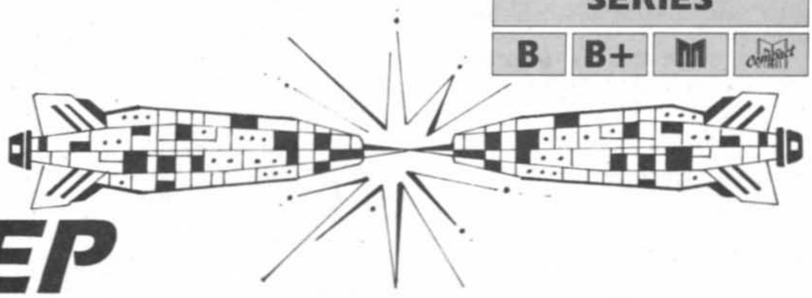
Roland Waddilove
looks at another
method of detecting
colliding sprites

SERIES

B **B+**



BEEP marks the spot

LAST month we looked at two simple methods of detecting collisions between sprites – EOR and peek.

There are many different ways of doing this and machine code arcade games often use more than one depending on the circumstances. So this month I'm going to show you one more method and this is probably the best and most widely used.

The routine used is extremely fast, accurate and does not involve peeking the screen memory. In fact the sprites do not have to be on the screen at all

Figure I shows two simple rectangular sprites that have collided. Sprite one is on the left, sprite two on the right.

The coordinates of sprite one are *x1,y1* and its width and height are *w1* and *h1*. These parameters will be known as they are also used by the print routine *print*.

Similarly sprite two is at *x2,y2* and is *w2* bytes wide and *h2* bytes high.

Here's the algorithm used to test for collision:

IF x1 is less than x2 THEN add w1 to x1, see if this is greater than x2 and return if false ELSE add w2 to x2, see if this is greater than x1 and return if false.

IF y1 is less than y2 THEN add h1 to y1, see if this is greater than y2 and return ELSE add h2 to y2, see if this is greater than y1 and return.

MACHINE CODE GAMES

Part 3

In plain language, it finds out which sprite is further left, one or two. It adds the width to the x coordinate of the left sprite and sees whether this is greater than the x coordinate of the right sprite. If it isn't they can't possibly have collided.

Then it tests which is higher up the screen, sprite one or two. It adds the height to the top sprite's y coordinate and sees whether this is greater than the bottom sprite's y coordinate. If it is the sprites have definitely collided.

To see this in machine code take a look at the subroutine labelled *collision* in this month's listing. It's a general routine which tests the two sprites whose coordinates are stored in *x1,y1, x2,y2* with dimensions in *w1,h1, w2,h2*. It returns with the carry flag set if they have collided.

The subroutine *bumped* sets up these parameters and calls *collision*. If the carry is set Ascii 7 is output and you'll hear a beep. Of course it's up to you what happens and in a real arcade game you would probably have an explosion or some other suitable routine.

That's enough of the theory, it's time to see the routines in action so enter and run this month's listing.

You'll see two sprites, one in the centre of the screen and one at the bottom left. Use the cursor keys to move the bottom sprite and notice what happens when they collide – you'll hear a loud beep. This is *bumped* letting you

Turn to Page 112 ▶

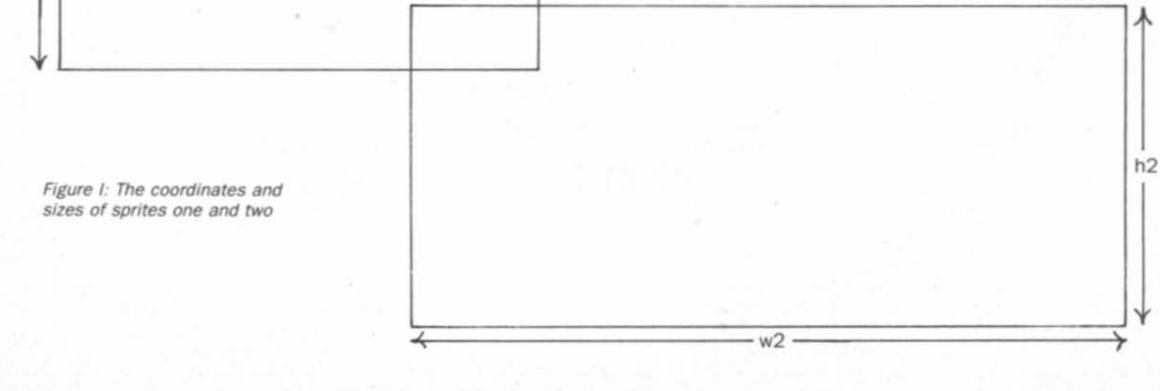


Figure I: The coordinates and sizes of sprites one and two

◀ *From Page 111*

know that *collision* has detected a collision.

Notice that it does not detect when you cross the border round the screen. Of course not, it hasn't been told to test for this.

So, with this collision detection method you can selectively test for any character or part of a character on the screen and totally ignore all others. And your character can pass over all background objects unaffected – yet still explode when it bumps into a bomb.

● *And that's where we'll leave collision detection. Next month we'll be looking at tracking sprites. These will automatically follow any given path.*

```
   10 REM Collision Detection II
   20 REM By R.A.Waddilove
   30 REM (c) Micro User
   40 MODE7:*TV0,1
   50 FOR I%=0 TO 47
   60 READ J%:I%?&C00=J%
   70 NEXT
   80 PROCassemble:CLEAR:*FX16
   90 MODE 2:VDU 23;8202;0;0;0;
  100 MOVE 100,100:DRAW 100,923:DRAW 117
8,923:DRAW 1178,100:DRAW 100,100
  110 CALL &900
  120 END
  130
  140 DEF PROCassemble
  150 old=&70:new=&72:rows=&74:columns=&
75:temp=&76:temp1=&78:temprows=&7A
  160 x1=&90:y1=&91:w1=&92:h1=&93:x2=&94
:y2=&95:w2=&96:h2=&97
  170 address=&80:x%=&82:y%=&83
  180 alien=&84:ax%=&86:ay%=&87
  190 osbyte=&FFF4:oswrch=&FFEE
  200 FOR pass=0 TO 2 STEP 2
  210 P%=&900
  220 [ OPT pass
  230
  240 .initialise
  250 LDA data:STA newdata+1:LDA data+1:
STA newdata+2  \set data
  260 LDX #35:STX ax%:LDY #128:STY ay%
\set alien x,y
  270 JSR convert  \get address
  280 LDX #4:LDY #12:JSR put  \print ali
en
  290 LDA data:STA newdata+1:LDA data+1:
STA newdata+2  \set data
  300 LDX #7:STX x%:LDY #216:STY y%  \se
t your x,y
  310 JSR convert  \get address
  320 LDA new:STA address:LDA new+1:STA
address+1  \save it
  330 LDX #4:LDY #12:JSR put  \print you
  340
  350 .start
  360 JSR bumped
  370 LDA data:STA olddata+1:STA newdata
+1:LDA data+1:STA olddata+2:STA newdata+
2  \set data
  380 LDA address:STA old:LDA address+1:
STA old+1  \set old
  390 JSR readkeys
  400 LDX x%:LDY y%:JSR convert  \get ne
w address
  410 LDA new:STA address:LDA new+1:STA
address+1  \save address
  420 LDA &240:.fx19 CLI:SEI:CMP &240:BE
Q fx19
  430 LDX #4:LDY #12:JSR print
  440 LDA #&81:LDX #&8F:LDY #&FF:JSR osb
yte:TYA:BEQ start  \Escape pressed?
  450 RTS  \return to Basic
  460
  470 .bumped  \set up block for collisi
on detection
  480 LDA x%:STA x1:LDA y%:STA y1:LDA #4
:STA w1:LDA #12:STA h1  \your x,y,size
  490 LDA ax%:STA x2:LDA ay%:STA y2:LDA
#4:STA w2:LDA #12:STA h2 \alien x,y,size
  500 JSR collision:BCC nothit
  510 LDA #21:LDX #7:JSR osbyte  \flush
sound buffer
  520 LDA #7:JMP &FFEE  \BEEP!
  530 .nothit
  540 RTS
  550
  560 .collision
  570 LDA x1:CMP x2:BCC c1  \x1>x2 ?
  580 LDA x2:CLC:ADC w2:CMP x1  \x2+w2>x
1 ?
  590 BCS checky:RTS
  600 .c1 ADC w1:CMP x2  \x1+w1>x2 ?
  610 BCS checky:RTS
  620 .checky
  630 LDA y1:CMP y2:BCC c2  \y1>y2 ?
  640 LDA y2:CLC:ADC h2:CMP y1  \y2+h2>y
1 ?
  650 RTS
  660 .c2 ADC h1:CMP y2  \y1+h1>y2 ?
  670 RTS
  680
  690 .readkeys  \right
  700 OPT FNinkey(-122):BEQ left
  710 INC x%:RTS
  720 .left
  730 OPT FNinkey(-26):BEQ up
  740 DEC x%:RTS
  750 .up
  760 OPT FNinkey(-58):BEQ down
  770 DEC y%:DEC y%:RTS
  780 .down
  790 OPT FNinkey(-42):BEQ nokey
  800 INC y%:INC y%
  810 .nokey RTS
  820
  830 .put
  840 LDA #&80:STA old:STA old+1
  850 .print  \uses new/old/X=rows/Y=col
umns/olddata/newdata
  860 STX columns:STY rows
  870 LDX #0:LDY #0
  880 LDA new:STA temp1:LDA new+1:STA te
mp1+1
  890 LDA old:STA temp:LDA old+1:STA tem
p+1  \save address of column
  900 .loop1
  910 LDA rows:STA temprows
  920 .loop2
  930 .newdata LDA &3000,X:EOR (new),Y:S
TA (new),Y
  940 .olddata LDA &3000,X:EOR (old),Y:S
TA (old),Y
  950 INX:BNE noinc:INC olddata+2:INC ne
wdata+2  \next data byte
  960 .noinc
  970 LDA old:AND #7:CMP #7:BEQ bottom1
  980 INC old:BNE next1:INC old+1:JMP ne
xt1
  990 .bottom1 \row
 1000 CLC:LDA old:ADC #&79:STA old:LDA o
ld+1:ADC #2:STA old+1
 1010 .next1
 1020 LDA new:AND #7:CMP #7:BEQ bottom2
 1030 INC new:BNE next2:INC new+1:JMP ne
xt2
 1040 .bottom2
 1050 CLC:LDA new:ADC #&79:STA new:LDA n
ew+1:ADC #2:STA new+1
 1060 .next2
 1070 DEC temprows:BNE loop2  \next row
 1080 CLC:LDA temp1:ADC #8:STA new:STA t
emp1:LDA temp1+1:ADC #0:STA new+1:STA te
mp1+1
 1090 LDA temp:ADC #8:STA old:STA temp:L
DA temp+1:ADC #0:STA old+1:STA temp+1
 1100 DEC columns:BNE loop1 \next column
 1110 RTS
 1120
 1130 .data  \character data
 1140 OPT FNequw(&C00)
 1150
 1160 .convert  \X,Y->address in new
 1170 LDA #0:STA new+1:TXA:ASL A:ASL A:R
OL new+1:ASL A:ROL new+1:STA new \X*8
 1180 TYA:AND #7:ADC new:STA new:LDA new
+1:ADC #0:STA new+1 \ +(Y MOD 8)
 1190 TYA:LSR A:LSR A:LSR A:ASL A:TAY  \
2*(Y DIV 8)
 1200 LDA table,Y:ADC new:STA new:LDA ta
ble+1,Y:ADC new+1:STA new+1
 1210 RTS
 1220
 1230 .table
 1240 OPT FNtable
 1250 ]
 1260 NEXT
 1270 ENDPROC
 1280
 1290 DEF FNtable
 1300 FOR I%=0 TO 31
 1310 ?P%=(&3000+I%*&280)MOD256
 1320 P%?1=(&3000+I%*&280)DIV256
 1330 P%=P%+2
 1340 NEXT
 1350 =pass
 1360
 1370 DEF FNequw(word)
 1380 ?P%=word MOD256
 1390 P%?1=word DIV256
 1400 P%=P%+2
 1410 =pass
 1420
 1430 DEF FNinkey(number)
 1440 [ OPT pass
 1450 LDA #&81
 1460 LDY #&FF
 1470 LDX #number+256
 1480 JSR osbyte
 1490 TYA
 1500 ]:=pass
 1510
 1520 REM Ball data
 1530 REM columns=4/rows=12
 1540 DATA 0,1,1,3,15,7,7,15,3,1,1,0,3,3
,3,3,15,15,15,15,3,3,3,3,7,3,3,3,15,7,7,
15,3,3,3,7,0,2,2,3,15,15,15,15,3,2,2,0
```

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Royal Pavilion lives on, courtesy two BBC Micros

Julian Rogers explains how his micros help to keep dry rot away

IN among the sinuously curving rafters that shape the most famous roofline on the south coast line – that of the Royal Pavilion at Brighton – there lurks a pair of BBC Micros.

The machines are helping to preserve the famous building for future generations of visitors by playing their part in a multi-million pound restoration project.

And with a little help from *The Micro User's* Body Building guru Mike Cook, we are stemming the tide of decay in this unique architectural jewel.

For those who don't know its history, the Pavilion was created by the then Prince of Wales – who later became the Prince Regent, then George IV – initially as a place of escape from the restrictive influence of his father, George III.

Surprisingly, the present Pavilion with its onion domes, minarets and fantastically ornate interiors, evolved from a humble farmhouse. This was the Prince's first – and uncharacteristically modest – residence.

The metamorphosis extended over a considerable period – from 1786 to 1823 and beyond – and passed through a number of distinct phases under the expert guidance of at least two different architects.

During this period the earlier buildings were rarely dismantled or demolished. Rather, they were adapted, incorporated or just plain covered over by new building work.

Thus, within the Pavilion today can be found much of the timber structure of the original farmhouse. It is this unusual process of development which, in large measure, has been responsble for the problems from which the building has suffered and which have now culminated in a £10 million programme of structural restoration.

The first phase of building work in 1787 involved the conversion of the farmhouse into an elegant neoclassical villa.

Although it appeared to be a solidly constructed brick building, in reality largely timber-framed construction was used and what seemed to be brick was actually a form of tiling. By 1801, further major additions had been made.

The last and most radical period of development began around 1815 and involved the conversion of the Pavilion by architect John Nash into the oriental fantasy we see today.

Among other alterations, new wings were added at either end and the large central onion dome and its flanking minarets were superimposed on the original building.

These were supported on a cast-iron frame threaded between the walls of the earlier structure and supported on a relatively solid foundation below.

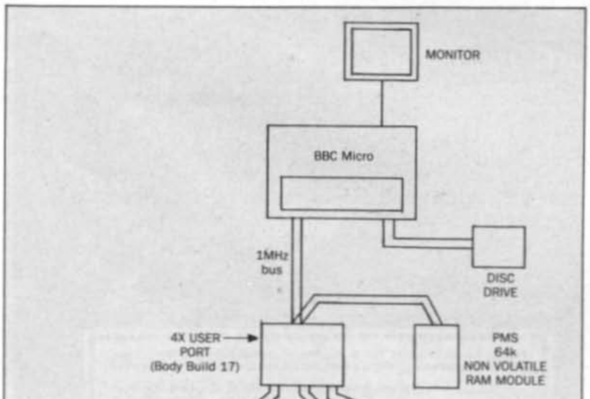
As new bits were added to the old, serious rainwater disposal problems arose. External rainwater downpipes became internal drains and blockages caused by leaves, pigeon droppings – or, more recently, wind-borne crisp packets – would immediately cause a serious leak into the internal structure of the building.

The problem was compounded by Nash who certainly didn't want his beautiful building cluttered up with anything as mundane as downpipes.

With so much timber in the structure the result was – and has been ever since – dry rot, a particularly nasty form of fungal timber decay which can cause massive beams to reach a state where they crumble at the touch.

This is far from an ideal state of affairs when you have – as at the Royal Pavilion – a few hundred tons of onion dome resting on such beams.

There are accounts dating from 1827 relating to the eradication of dry rot in a particular area for a matter of what was then a few pounds. The present account is running into millions. Obviously if the Pavilion is to be preserved, and another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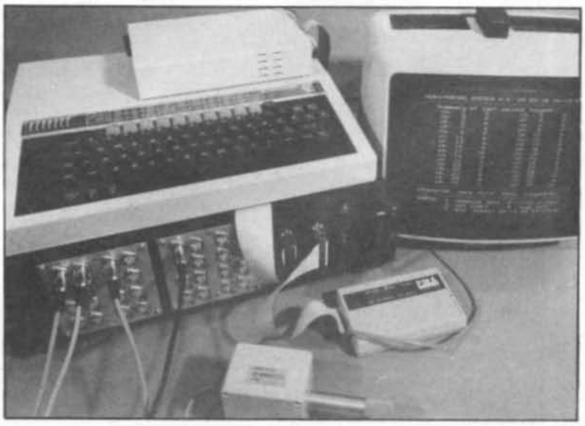
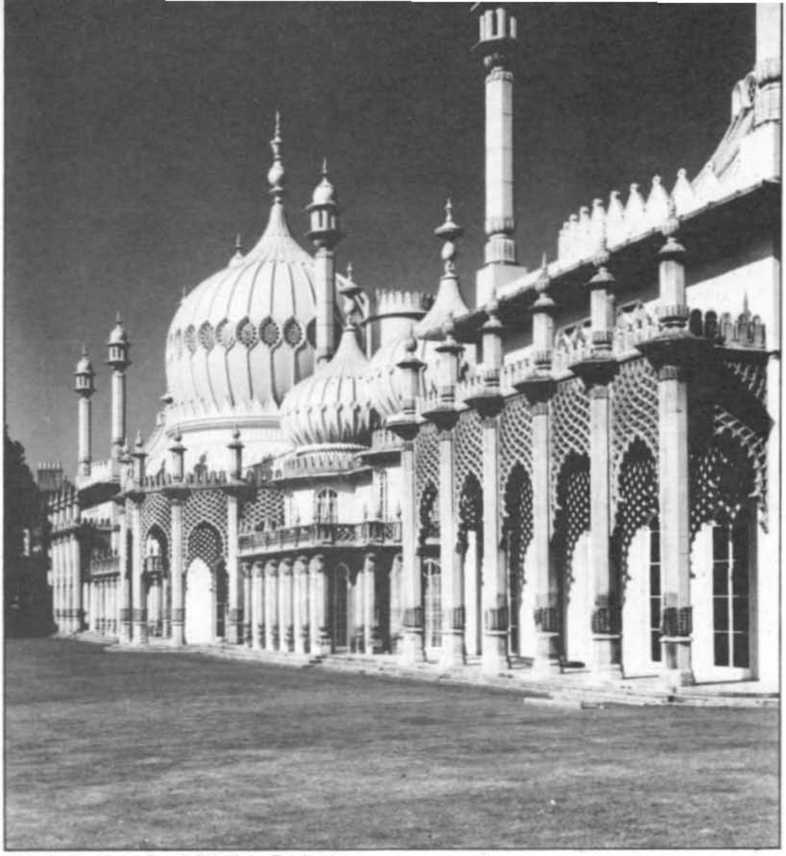
Resistance to voltage converter
1-16
17-32
Channels 17-32 humidity or temperature
CHANNEL SELECTION Switches (Relays or solid-state) under program control
ADC (Body Build 22)
REAL TIME CLOCK (Body Build 12 or Technomatic)

Figure I: Schematic arrangement



Second unit during development. In the foregound are a humidity probe and PMS ram.



East front of the Royal Pavilion, Brighton.

massive bill in 20 or 30 years avoided, something has to be done.

The most effective method of preventing dry rot is to stop water getting in to the structure. Though the rot is called "dry" this only refers to the appearance of the wood after the fungus has had a good meal. To get a hold the rot needs warm, damp, humid conditions.

Although the Pavilion roof is being improved using the best materials it is a very difficult and complex design which cannot be radically altered without destroying what is an historic structure. Thus the risk of leaks will always remain – leaks which, if undetected, could lead to another dangerous and very costly outbreak of rot.

Careful monitoring of the structure is therefore very important and it is in this crucial area that the BBC Micros play their part.

For just over a year a BBC Micro has formed the heart of a system logging the condition of the structure of the banqueting room – a large and complex Pavilion wing with a beautiful pagoda roof.

Every hour the micro records the output from sensors which measure temperature, relative humidity and the water content of various timbers within the structure.

By examining these parameters we hope to be able to detect leaks before they can do serious damage and to gain some insight into the long term changes in moisture levels within the building.

The water content of the timber is deduced by measuring the electrical resistance between two probes – stainless steel screws inserted into the timber. Temperature is measured by special integrated circuits which output a voltage proportional to temperature.

Relative humidity is measured by a sensor which detects the change in value of a special capacitor as it absorbs or loses moisture in sympathy with changes in humidity. This is again converted into a voltage.

Outputs of the various sensors, of which there are up to 14, are switched to the BBC Micro's analogue port by a system of relays which are selected under program control from what amounts to a second user port derived from a 6522 VIA connected to the 1MHz bus.

A real time clock is connected to the on-board user port and this is used to trigger the data collection every hour.

Initially I used a disc for program and data storage. By setting links the BBC Micro can be made to run a program on power-up and this is an essential feature unless a complete battery back-up system is provided.

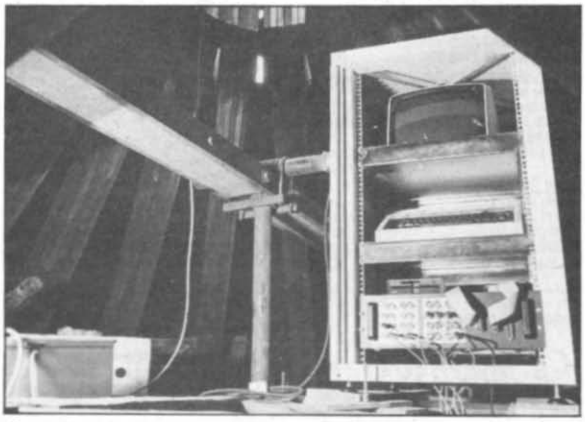
Over a long period minor power disturbances are inevitable and it is essential that the system can reset itself under these circumstances.

I have now passed on to storing data and programs on battery-backed ram – the PMS 64k ram module.

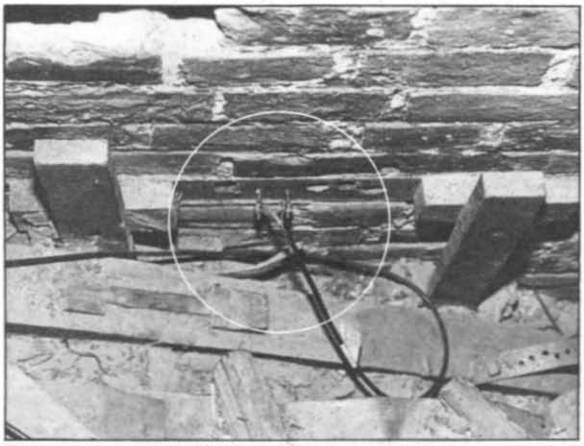
This, together with the PMS Utility sideways rom, has produced a system with no moving parts which should be more reliable than discs – although it should be said that in four months of continuous use the discs gave no trouble.

I still retain a disc drive to periodically download data for processing on our BBC Master located in the workshops where data can be printed out in tabular

Turn to Page 116 ▶



Second unit during installation in the roofspace above the Pavilion's music room.



Timber moisture probe in banqueting room wall.

◀ *From Page 115*

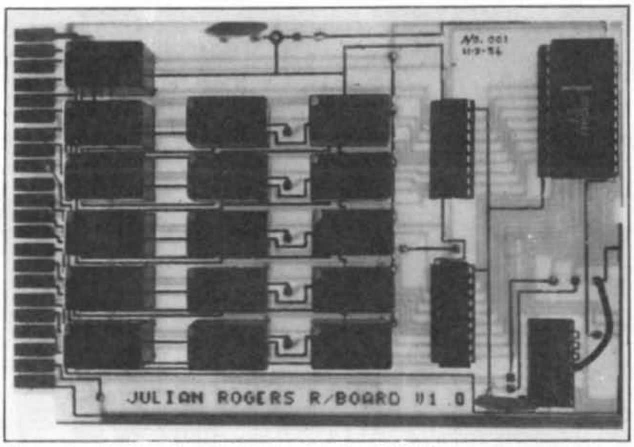
or graphical form. A second unit, with provision for 32 channels, is now being installed in another area of the Pavilion.

The sensors are switched by relays into The Micro User technical editor Mike Cook's "four and a half digit" ADC board. This does the measuring and has a number of advantages over the BBC Micro's analogue port in this sort of application.

Connection between the micro and the ADC, the Technomatic real time clock and the relay boards, is courtesy of a Mike Cook "user port times 4" board. A second user port board provides interfacing for rain and wind gauges and a solarimeter sunshine gauge which I hope will be future additions.

Construction of the second unit is an improvement on the first which was largely breadboarded using Veroboard and Verowire systems.

All the circuits I built for the second unit use boards designed using the "PCB" Cad program from Pineapple Software which performs faultlessly on my Master and is a utility which I thoroughly recommend.



Channel selection board designed using "PCB" Cad program

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Julian Rogers is Principal Keeper of Conservation, The Royal Pavilion, Brighton.

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In Part 11 of his series on spreadsheets Nigel Peters puts Ultracalc to the test

Rom route to larger models

THIS month we'll be taking the first of two looks at Ultracalc, a spreadsheet program from BBC Soft. In particular we'll be seeing where it differs from our old friend Mini Office II.

At one time I would have said that the most obvious difference was that Ultracalc is a program on a chip. Just insert the rom into your micro, enter *CALC and away you go. No loading from tape or disc as you have to do with Mini Office II.

The trouble is that I can't say that now because Instant Mini Office II, with no less than four chips, has arrived!

Be that as it may, the fact that Ultracalc comes on rom makes it much easier to use. And as the micro doesn't have to hold the spreadsheet program itself, there's a lot more memory available for data.

The result is that when you enter Ultracalc you've got a grid of 255 rows and 63 columns (A to BK) ready for use.

Of these you only see 80 cells on the screen, the active or current one being marked by two arrow signs – Ultracalc's cursor.

The screen acts as a window on to the spreadsheet and just as with Mini Office II you can wander around the grid using the cursor control keys, which autorepeat if held down long enough.

A nice feature is the ability to use both Shift and an arrow key to get the sheet's cursor to leap several cells at once. Doing this it travels four cells at a time across the grid, or 10 cells upwards or downwards, making movement a very speedy operation.

As with Mini Office II there's a command that allows you to move the cursor to a named cell on the grid making it active.

However, unlike Mini Office II this isn't available at the touch of a function key. In fact Ultracalc makes very little use of function keys and menus and so operating it is very different to running Mini Office II.

What Ultracalc does is to allow you to enter commands, preceding each one with the slash (/) found on the same key as the question mark.

The command to move to a particular cell is:

```
/G <cell reference>
```

where the cell is indicated using the normal method of column letter followed by row number. So to move the cursor to cell D3, making that active, you just use:

```
/G D3
```

With Ultracalc the commands used don't have to refer to a single cell. They can refer to a group of cells or an area. An area is a rectangular set of cells defined by two cell coordinates. The first gives the top left cell of the area, the second the bottom right. Figure I shows some areas and their identifiers.

Suppose we wished to make a cell blank. Ultracalc allows us to do this with the /B command. So to make D3 blank we'd make it the active cell and use:

```
/B
```

Should we want to make the cells A1, B1, A2, B2 blank we could do it by making each active in turn, again using:

```
/B
```

There is a better way. This is to tell the program to delete the area using:

```
/BA A1B2
```

This is the Blank Area command and saves a lot of typing.

This ability to deal with whole areas at a time is extremely valuable. You can use the /S command to save not only the whole grid but also parts of it and use / V to verify that the save has worked. The /L command can then be used to reload the spreadsheet as required.

Should there already be a spreadsheet in memory, the second spreadsheet is superimposed on the first. Occupied cells in the sheet to be loaded overwrite previous contents, if any.

However, when a cell in the sheet to be loaded is blank, then any previous contents that cell may have had are left intact. They "show through" the new sheet.

With a little care, this allows you to work on different parts of a model at different times, bringing them together when each has been tested separately.

When it comes to what you can enter into the cells it's very much the same as with Mini Office II. You can enter values, labels and formulae.

Unlike Mini Office II you don't have to warn the program that it's a formula you're entering. What Ultracalc does is to take what you type in and, if it's not the straightforward case of a numeric, try to interpret it as a formula.

If this makes sense – giving a result – then what you type in is taken as a formula. Failing that, it's entered as a label. Should you want to force a label which would otherwise be taken as a formula, say A1+A2, you just precede it with a pair of inverted commas, ".

Initially values are shown rounded to the nearest whole number, so 7.8 becomes 8. Like Mini Office II this is for display purposes only, the real value being used in calculations.

As you might expect the number of decimal places shown can be altered by a / command. Similarly at the start of things only seven characters of a label are shown though they can be longer.

A clever feature of Ultracalc is the way it handles errors. Suppose you had a series of formulae which had a division in them. If the value of the divisor becomes zero then the result of the formula is invalid.

In this case, rather than bring things grinding to a halt the program flags the cell with ERROR, leaving the formula intact in the hope that allowable values will come along.

Having said what can be put in the

Turn to Page 118 ▶

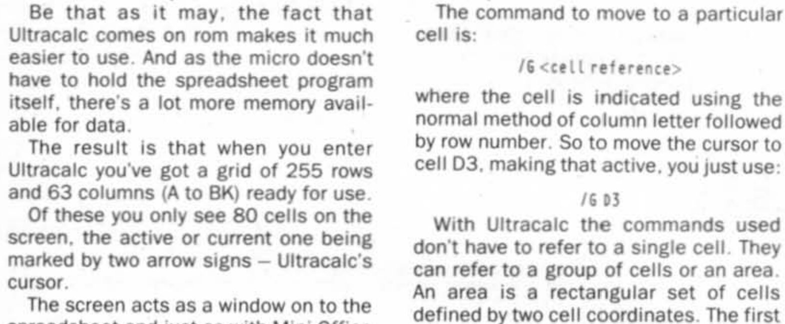


Figure I: Areas of a spreadsheet

◀ *From Page 117*

cells, Ultracalc is fairly similar to Mini Office II when it comes to actually entering data. At the top of the screen is the information or status area consisting of three lines.

The first is the reference line which gives the name of the active cell, the type of its contents and any necessary prompts. Below this is the contents line showing – surprise, surprise – the cell's contents. Finally comes the input line which holds the data as you type it in.

It's all very much the same as Mini Office II and editing the input line isn't that different. Should you make a mistake you can jettison the whole line by pressing Escape or correct it by moving the cursor up and down the line deleting or adding letters as necessary. The keys *f8* and *f9* are used to move left and right respectively.

Should you want to correct an error in a cell you can either retype it or bring its contents up to the input line for correction. This is simply done by making the errant cell active and pressing Shift and Copy at the same time.

While on the subject of the input line, Ultracalc has a nice way of creating formulae. When you press the Copy key the coordinates of the active cell are placed at the end of the input line. Using this you can move around the screen and build up a formula using Copy and the necessary operators.

Once you've constructed the desired formula on the input line then it can be entered into the cell of your choice. It's a surprisingly effective way of going about things.

Still on the subject of formulae, these can be copied both absolutely or relatively, the prompts being the same as for Mini Office II. However, instead of pressing a function key to start the copying process, you have to use a slash command.

Suppose you wanted to copy a formula from the active cell into cell B3. To do this you would enter:

```
//B3B3
```

and the copying would be done – after you had decided between relative or absolute copying or both.

It may seem a bit odd that the receiving cell's coordinates are repeated twice but this is because the actual command is:

```
//<area>
```

where area is defined as before. This means that the active cell can be copied into a whole set of cells just using one command.

So to copy the active cell into each of the nine cells A1, A2, A3, B1, B2, B3, C1, C2, C3 you would use:

```
//A1C3
```

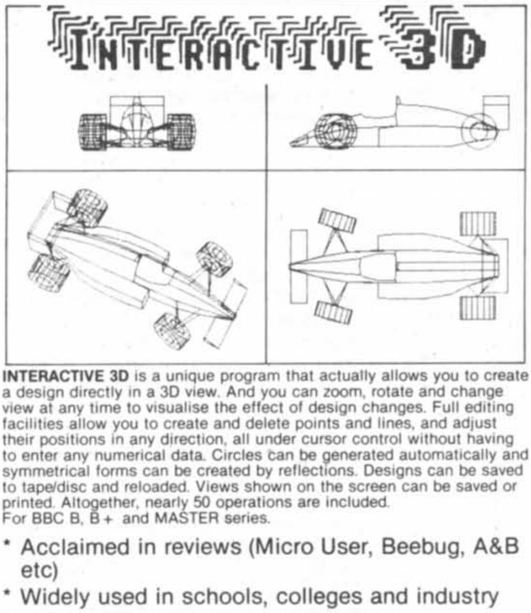
And you're not just stuck with copying one cell at a time. With the replicate command you can copy a number of cells simultaneously.

Suppose you wanted to copy the three cells A1, A2, A3 into corresponding cell in columns D, E, F. With Ultracalc all that's necessary is one command:

```
/R A1A3 D1F3
```

and the job is done.

● *From this you'll see that with Ultracalc it's easy to build up large models. What we can do with them we'll see next month as we look at some of its more sophisticated commands and functions.*



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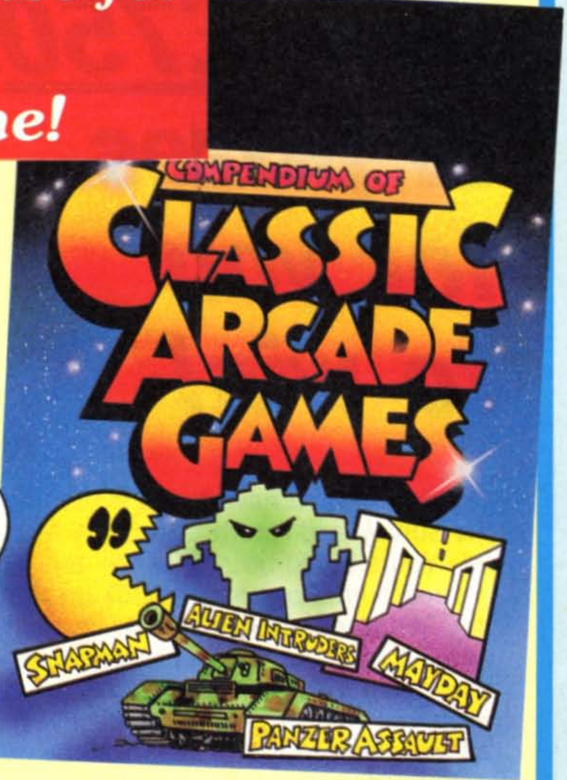

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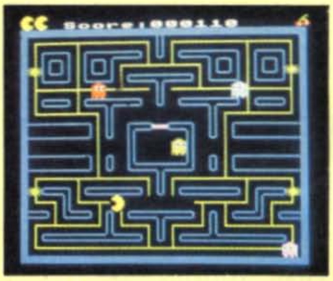

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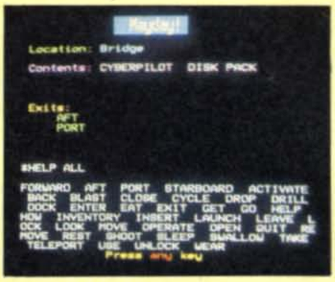

```
Mayday!
Location: Bridge
Contents: CYBERPILOT  DISK PACK

Exits:
    AFT
    PORT

*HELP ALL

FORWARD  AFT  PORT  STARBOARD  ACTIVATE
 BACK  BLAST  CLOSE  CYCLE  DROP  DRILL
 DOCK  ENTER  EAT  EXIT  GET  GO  HELP
HOW  INVENTORY  INSERT  LAUNCH  LEAVE  L
OCK  LOOK  MOVE  OPERATE  OPEN  QUIT  RE
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 TELEPORT  USE  UNLOCK  WEAR
          Press any key
```

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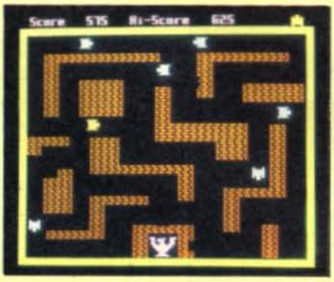

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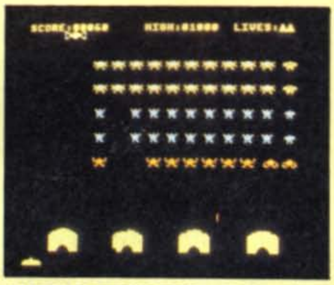

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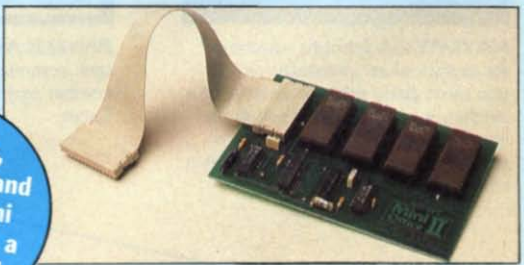

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16 - 22 ☐ 31 - 39 ☐ Over 51 ☐

Sex? M / F Occupation?__________

What area of computers or computing are you most interested, (e.g. business, games, communications, programming, hardware)?

____

____

How do you rate your knowledge of:	None	Poor	Average	Good	Excellent
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What micro(s) do you own or use?

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BBC Compact ☐ Electron ☐

Does it use: Basic I☐ Basic II ☐

How long have you had a BBC Micro?

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Which one(s)?__________

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Which one?__________

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Disk drive ☐ 40☐ 80 ☐ Single ☐ Double ☐
Printer ☐ Type?__________
Modem ☐ Which software? __________
Sideways RAM ☐
Please list any others:__________

What other hardware would you like?__________

Please indicate which of the following software you have:

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Spreadsheet ☐ Assembler ☐
Database ☐ Basic utilities ☐
Graphics package ☐ Disc utilities ☐

What piece of software would you most like to have for your micro?__________

What do you use your BBC Micro for (fill in your own ideas in the spaces at the end of the list)?

	Only	Mostly	Some	Not much	Never
Arcade games	☐	☐	☐	☐	☐
Adventure games	☐	☐	☐	☐	☐
Programming	☐	☐	☐	☐	☐
Business	☐	☐	☐	☐	☐
Own letters	☐	☐	☐	☐	☐
Home accounts	☐	☐	☐	☐	☐
....	☐	☐	☐	☐	☐
....	☐	☐	☐	☐	☐

Which software do you use most frequently?__________

Is there any software (apart from games) you've bought that you never use?__________

Thank you for filling in this survey. Now send it to:
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1-2 years ☐ 2-3 years ☐ from issue 1 ☐

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What do you like most about The Micro User?__________

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How often do you buy the magazine cassette or disc?

Every month ☐ Never ☐ Occasionally ☐

If occasionally, what prompts you to buy it?__________

____

Which program listings do you type in?	Usually	Sometimes	Never
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Utilities	☐	☐	☐
Tutorials	☐	☐	☐
Educational	☐	☐	☐

What is the maximum length of listing you would want to type in?

Half page ☐ 1 page ☐ 2 pages ☐
3 pages ☐ 4 pages ☐ 5 pages ☐

Please circle the number which matches your level of interest in the following subjects (0 lowest — 9 highest):

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Hardware reviews	0	1	2	3	4	5	6	7	8	9
Body Building	0	1	2	3	4	5	6	7	8	9
Beginner's Basic	0	1	2	3	4	5	6	7	8	9
Beginner's machine code	0	1	2	3	4	5	6	7	8	9
Machine code games	0	1	2	3	4	5	6	7	8	9
Beginner's comms	0	1	2	3	4	5	6	7	8	9
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Mad Hatter	0	1	2	3	4	5	6	7	8	9
Hac Man	0	1	2	3	4	5	6	7	8	9
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START OF A NEW SERIES!

THE MICRO USER

PROGRAM Library No. 1

Compiled by Steve Turnbull

LIBRARY is a new regular feature in *The Micro User* which will give you short, useful routines and functions in various languages that can be used alone or incorporated into your own programs.

Now you can pass your hard-earned experience on to other programmers – and learn as you save time by using routines written by others.

Each routine will be accompanied by a demonstration program, or a description of how to use it. To start off, here are some routines for machine code, Basic and Wordwise Plus.

Title: HEXOUT
Language: 6502 Machine Code
Author: Jeremy-North

When you want to output numbers from machine code you can use decimal, but that needs decimal division – which is slow.

A much simpler and faster way is to use hexadecimal. The routine, from line 210 to 320, prints in hexadecimal form the value of the accumulator, *A*.

It does not perform leading zero suppression, so the value nine would be printed as 09. Registers *X* and *Y* are not affected, but *A* and the flags are corrupted.

The demonstration program prints the characters from A to Z with the hexadecimal form of their Ascii values beside them.

```
100 REM * HEXOUT *
110 DIM code 256
120 oswrch=&FFEE
130 FOR L%=0 TO 2 STEP 2
140 P%=code:[OPT L%
150 .test LDX #ASC"A"
160 .loop TXA:JSR oswrch
170 LDA #32:JSR oswrch
180 TXA:JSR hexout:JSR&FFE7
190 INX:CPX #ASC"Z"+1
200 BNE loop:RTS
210 .hexout PHA:CLC:AND#&F0
220 ROR A:ROR A \get hi
230 ROR A:ROR A \nybble
240 JSR nybble  \send it
250 PLA:AND #&F \get lo
260 .nybble CLC \nybble
270 ADC #ASC"0" \set dec
280 CMP #ASC"9"+1 \if >
290 BCC not-A-F \ make
300 ADC #6   \ A to F
310 .not-A-F
320 JMP oswrch \print it
330 ]:NEXT:CALL test
```

Title: PRINT TEXT
Language: 6502 Machine Code/Basic II
Author: Petra Galloway

If you want to print a string from machine code it can be fiddly messing around with loading a string address into the *X* and *Y* registers.

The call to the *print-text* routine is followed immediately by the required string terminated by a special marker byte.

When the call is made, the routine prints out the string and then returns to the first instruction after the marker byte.

It is possible to include control codes in the string, but great care must be taken that the value of the marker does not appear in the string.

Can anyone devise a more versatile version?

```
100 REM * PRINT TEXT *               240 LDY #0
110 DIM code 256:marker=&EA          250 .print-loop
120 osasci=&FFE3:txtptr=&F2          260 INC txtptr
130 FOR L%=0 TO 2 STEP 2             270 BNE print-skip
140 P%=code:[OPT L%                  280 INC txtptr+1
150 .test                            290 .print-skip
160 JSR print-text                   320 LDA (txtptr),Y
170 EQUS "Hello!"                    300 CMP #marker
180 EQUB 13                          310 BEQ print-exit
190 EQUB marker                      320 JSR osasci
200 RTS                              330 JMP print-loop
210 .print-text                      340 .print-exit
220 PLA:STA txtptr                   350 JMP (txtptr)
230 PLA:STA txtptr+1                 360 ]:NEXT:CALL test
```

Title: LINE NUMBER STRIPPER
Language: Wordwise Plus
Author: Tim Arrowsmith

Where a program does not contain any GOTOs or GOSUBs it is easier to edit the program in Wordwise Plus without the line numbers.

To get a program into Ascii format from Basic:

```
LISTO 0
*SPOOL name
LIST
```

The program lists and is spooled to the media. When it is complete type:

```
*SPOOL
```

Enter Wordwise Plus and load the new file. First delete LIST and *SPOOL from the beginning and end of the file then type AUTO at the beginning of the text. Now save it again for security.

Select segment zero and type in the line number stripper segment program. Either use the full command version as shown on the left, or the abbreviated command version as shown on the right.

Press Shift+f0 to run, and if the program seems to be running wrongly or the end is reached press Escape.

The program operates by seeking a Return then moving one character beyond it. Then the next five characters are deleted, which takes in the spaces and line number listed by Basic.

The text is DISPLAYed after each line number so that you can see when

Title: ERROR RECOVERY
Language: 6502 Machine Code/Basic II
Author: Jim Bream

When you write a stand-alone piece of machine code software it is important to take control of the break vector – *brkv*.

This way, any errors that occur due to disc accesses or errors generated by your own program are trapped by your software as opposed to the language rom that was active when your code was entered.

The demonstration program sets up a simple language which accepts an input line using the standard Mos Osword 0 routine. The parameter block for this routine starts at *input*. The line can be terminated by Return or Escape, if the carry flag is set then Escape was pressed and the error format, as in lines 330 to 350, is entered:

```
BRK
EQUB error-number
EQUS "error text"
BRK
```

Otherwise the input line is sent directly to the Mos command line interpreter, allowing any * commands to be executed.

Type in the program, save and then run it. To test the error handling code press Escape or generate other errors, for instance by typing *ZZZZZZZ. To get back to Basic type *BASIC.

```
100 REM * ERROR RECOVERY *
110 DIM code 256,buffer 256
120 length=80:lo-asc=ASC" "
130 hi-asc=ASC"~"
140 err-ptr=&FD:errv=&202
150 asci=&FFE3:newl=&FFE7
160 wrch=&FFEE:word=&FFF1
170 byte=&FFF4:cli=&FFF7
180 FOR L%=0 TO 2 STEP 2
190 P%=code:[OPT L%
200 .test
210 LDA #error DIV256
220 STA errv+1
230 LDA #error MOD256
240 STA errv
250 .main-loop
260 LDX #&FF:TXS
270 LDA #ASC"="
280 JSR wrch
290 LDY #input DIV256
300 LDX #input MOD256
310 LDA #0:JSR word
320 BCC okay
330 BRK:EQUB 17
340 EQUS "My Escape"
350 BRK
360 .okay
370 LDY #buffer DIV256
380 LDX #buffer MOD256
390 JSR cli
400 JMP main-loop
410 .error
420 LDA #126
430 JSR byte
440 JSR newl
450 LDY #0
460 .err-loop
470 INC err-ptr
480 BNE err-skp
490 INC err-ptr+1
500 .err-skp
510 LDA (err-ptr),Y
520 BEQ err-end
530 JSR asci
540 JMP err-loop
550 .err-end
560 JSR newl
570 JMP main-loop
580 .input
590 EQUW buffer
600 EQUB length
610 EQUB lo-asc
620 EQUB hi-asc
630 ]:NEXT:CALL test
```

the run is completed.

Don't run the program twice because you will lose the first five characters of each line.

To get the program back to Basic, save the text, and type:

```
*BASIC
*EXEC name
```

```
REM * LINE STRIPPER *
SELECT TEXT      se.te.
REPEAT           rep.
FIND "|R"        fi."|R"
CURSOR RIGHT     cu.ri.
DELETE AT 5      de.at 5
DISPLAY          dis.
UNTIL FALSE      u.0
```

Send your routines – with full details of the language it is written in and the hardware/software requirements – on disc or tape to Steve Turnbull, Library, The Micro User, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

Remember to enclose a stamped addressed envelope for the return of your media. Five blank discs will be sent to the authors of any routines published.

Title: KEY INPUT
Language: Basic I or better
Author: Terry Paul

In Basic you often want to select one key from a choice of several – while the rest of the keyboard is unresponsive. The simplest and most used method looks like this:

```
  10 PRINT"Press A, B or C?"
  20 G%=GET AND &5F
  30 IF G%<>65 AND G%<>66
AND G%<>67 GOTO 10
```

This works but the code needs to be repeated every time it is required. If you then start adding complications like switching the flashing cursor on when input is required and off when input is completed then space is wasted.

The solution is to have a single input routine which replaces GET, takes as a parameter just those keys which can be accepted and provides the selection facility. The FNin function does this.

The example program shows a simple Yes/No selection, but allows upper and lower case. Inside the routine the variable *k$* holds the keys which are acceptable.

The GET$ function takes a key from the buffer and it is compared with the permitted characters using the INSTR function. This returns the position of the second string within the first string – the acceptable characters.

If the key pressed is not one of the acceptable ones then the value returned by INSTR is zero.

The VDU command in line 240 looks complicated but all it does is send Ascii value 7 (beep) if the key pressed is 0 (not accepted), or Ascii 0 (does nothing) if the key pressed is not zero.

The loop is repeated until a valid key is pressed and then it exits returning the position of the key pressed within the allowed-keys string.

In the example program the only values that will be returned are 1-Y, 2-y, 3-N and 4-n. Any other key – apart from Escape and Break – will simply cause a beep.

Using this routine you can provide protected single key input anywhere within your program.

```
100 REM * KEY INPUT *
110 PROCcursoff:REPEAT
120 PRINT"Catalog (y/n)?";
130 A%=FNin("YyNn"):PRINT
140 IF A%<=2 THEN *CAT
150 UNTIL A%>=3
160 PROCcursoff:END
170 DEF PROCcursoff
180 VDU23,1,0;0;0;0;:ENDPROC
190 DEF PROCcurson
200 VDU23,1,1;0;0;0;:ENDPROC
210 DEF FNin(k$)
220 LOCAL I%:PROCcurson
230 REPEAT I%=INSTR(k$,GET$)
240 VDU -7*(I%=0):UNTIL I%>0
250 PROCcursoff:=I%
```

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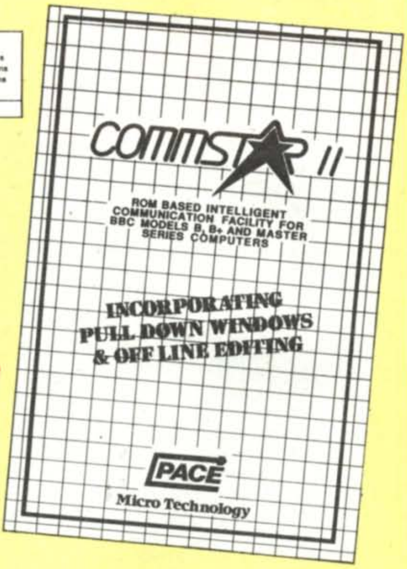
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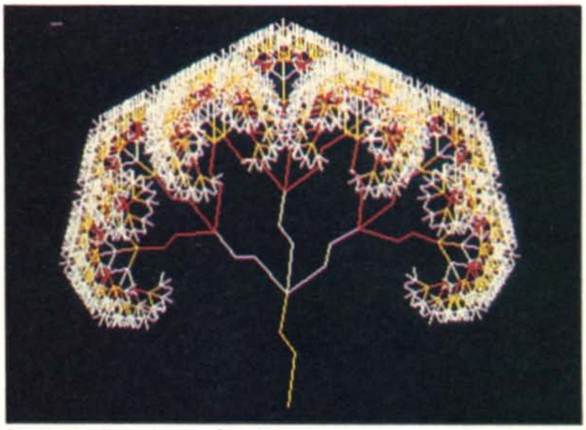
WELCOME to the HALCIEN language!

HALCIEN

Press SPACE to continue.

Halcien's title screen



The result of running the fractal tree program

Halcien daze . . .

Mike Cook finds this new language a great leveller

HALCIEN, apart from being a blue kingfisher, is a new language from High-level Algorithms Ltd.

The name is an acronym (like most things in computing) and, like many acronyms, it seems as though the name was thought up first and then the thesaurus searched to see what it could possibly stand for. It is claimed that Halcien stands for High-level ALgorithmic Computer Instruction ENcoding language. See what I mean?

The language itself comes on a 16k eprom and it will run on all models of the BBC Micro and second processor. It is accompanied by a utilities disc, function key strip and a 246-page manual in a loose-leaf A4 ring binder.

Learning a new computer language is a great leveller. All of a sudden you are a beginner again having to learn everything from scratch. It is clearly impossible to cover every aspect of a language in a review, so what I have done is to investigate and summarise its strengths, weaknesses and foibles.

Halcien is primarily a procedural-orientated language in similar vein to Logo or Forth. The programming task consists of creating new procedures from existing ones. These then become part of the language and can be used to define yet more procedures.

Eventually there is a procedure that performs all the operations you require which is then simply invoked (or run) by typing its name. The language is said to be extensible and, as you use it more and more in one area, it becomes your own specialised language; you never have to re-invent the wheel.

This is a very efficient way to work as you can test out each procedure as you write it and sort out your bugs as you write them – not some time later when you come to run a great mass of code.

Where Halcien differs from Forth is that it has a data stack and an operator stack. The latter allows statements to be written in a syntax similar to Basic and frees you from the reverse Polish notation that often puts beginners off Forth.

Halcien, like Forth, is a semi compiled language. That means the program you write is converted into some intermediate form and interpreted as it is run. The intermediate form is called H-code and its interpreter is contained in the Halcien eprom.

It is not possible to save the H-code. The compiling is done when a program file is loaded in. The manual assures me that the compilation is so efficient and quick that it is not worth saving the H-code directly.

When Halcien is implemented on other computers the H-code will be identical, only the H-code interpreter needs to be written to run on other microprocessors. This is similar to the UCSD P-system, although Halcien is a lot nicer to use.

With a procedural structure it should be suited to most tasks but Halcien supports interfacing devices in a rather curious way, that of a block move. The block move instruction will move any number of bytes from one location to another.

It is possible to get the address of a variable so, to input data from the user port, you have to move a block of one byte in length into the address of a variable. After that the variable can be used normally.

Thus it is possible to use Halcien as a control language. However, the language designers have chosen to develop Halcien in two distinct areas – text handling and graphics.

At the heart of the text handling capabilities is the text editor which can be used to prepare your programs, although you can use any other word processor that produces pure Ascii files.

The text editor has a slightly different display to most. Below the flashing cursor is an arrow set in a row of dots and numbers enabling you to tell exactly how far along a line you are at any time. The cursor points to the character after the one you are going to affect in the same way as all BBC Micro word

Turn to Page 126 ▶

◀ *From Page 125*

processors. This is a pet hate of mine and is why I try to avoid them all.

However, the built-in text editor is part of the language and can be extended and customised to suit your own requirements.

It can for example be extended into a full blown word processor or document creator – each editor command has a keyword associated with it so that you can incorporate editing commands into your procedures.

With this capability you can create customised documents from standard ones replacing words, phrases and even arithmetic calculations. Word processing languages like this and Wordwise Plus are comparatively new and there is still a lot of exciting new work to be done with them.

The most interesting aspect of Halcien for me was its graphic handling capacity. At its simplest it supports lines, boxes and arcs (a circle is simply an arc of 360 degrees) all accepting a number of parameters in a rather similar way to Basic.

A collection of shape-drawing statements can be grouped together in a structure called an icon which can then be subjected to rotation, scaling and translation (position change).

This means you can draw something by writing a procedure using absolute points and later have that same drawing reproduced at any position on the screen, larger or smaller and rotated at any angle. This allows you to re-use the same graphics procedure at several points on your display.

As these manipulations are built into the language it saves a lot of code writing and it must be one of the major attractions of Halcien.

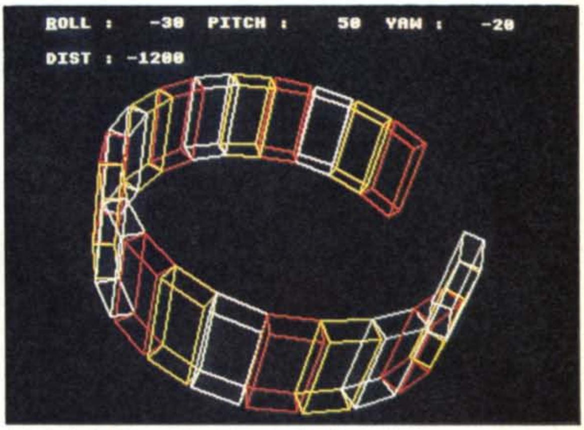
As well as two dimensional drawing, Halcien also supports the drawing of three dimensional wire-frame icons. Just like the two dimensional ones they can be scaled and translated, but this time they may be rotated around any of three axes.

With this built-in facility it is comparatively easy to "fly through" a complex three dimensional scene without having to change the database.

Images can be drawn in a buffer and then transferred rapidly to the display screen, a technique available even on the plain model B.

A buffer image is in encoded form and may be saved to disc – depending upon the nature of the drawing this might take up less disc space than a conventional screen memory dump.

The graphics also support shadow ram to allow more memory for screen buffering. The enhanced graphics commands of the Master computer are also accessible from within Halcien.



```
ROLL :   -30  PITCH :    50  YAW :   -20
DIST : -1200
```

A ring of wire-frame boxes drawn using the package

Well what was it like to use?

The manual started out well with a section on getting started and held your hand as you ran an impressive demonstration program of the earth as seen from an orbiting satellite.

Each frame took about 10 seconds to calculate and display, but considering there are about 800 contour points to link, this is quite impressive – the drawing part takes only about two of those seconds.

However, the manual then pitches into a description of the various aspects of the language and about a hundred pages later you learn about the editor so you can try your hand at programming – I would have preferred a small tutorial session at the beginning of the manual. Despite this the manuals are quite well written and cover the various aspects of the language with well rounded explanations and a liberal sprinkling of illustrative examples.

Those of you whose only language is Basic might be a little confused about the discipline most other languages demand.

For example, in Halcien the space is a very important character and must be included: The statement PRINT (100 + 200) must have spaces between the two numbers and the + sign, as well as separating the brackets. There are very good technical reasons for this that contribute to the language's speed and compactness. However, it could be a minor source of frustration to some people.

On the other hand, the syntax of Halcien is quite readable (unlike Forth) and Basic users should not have too much trouble adapting.

As Halcien is a procedural-based language it does not have (or need) line numbers. Statements are simply executed one at a time. This means that many statements may be placed on one line leading to what I call sausage programming.

The use of line spaces and indentation can greatly increase the readability of a program and the example programs on the utilities disc show just how readable it can be.

There is no point giving an example of a line of Halcien as it would only serve to confuse at this stage, suffice it to say that once you have read the manual it is quite clear what is happening.

It took me a little time to figure out how to get out of Halcien – in fact you use an OS command. This accepts a string that is passed to the operating system. You use it as you would use any system command.

In this way it is easy to incorporate operating system commands into your procedures to gain help from sideways roms for screen dumps and so on. Incidentally if you do try a star command you get the error message "Ambiguous file name".

In conclusion, Halcien is quite a powerful language that should be relatively easy to learn. Its power comes into evidence when doing work in a specific area, as the language grows towards your application.

For those interested in graphics Halcien has a lot to offer and I think most other languages would struggle to give you these facilities. It is very reasonably priced and well documented. You are not going to learn it overnight but it's well worth learning. ■

Product: Halcien
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Part of Mike Bibby's series on machine code takes a closer look at indexing

Addressing the right problem

IT'S one thing to be able to solve a problem – it's quite another thing to realise you've got a problem in the first place.

Take this month's topic: Indexing. It's quite straightforward when you know how it's done, but the person who first thought of the technique deserves a Nobel prize for computing innovation.

Essentially, indexing allows us to refer to memory locations sequentially without having to spell out the address of each one in full.

This offers us the same kind of space advantage that loops do: A lot of action for a little code.

First we need to become aware of the problem we're solving. Program I should do that: It simply places a row of five asterisks on to a Mode 7 screen, about two thirds the way down.

There's nothing magic about &7E80, it's just a convenient memory location marking the beginning of a line on the unscrolled Mode 7 screen. Using it allows us to see our assembly listing above the output asterisks.

As you can see, though the program hardly presents any challenge to the intellect, it is boring in the extreme – all those repetitive STAs. There's got to be an easier way ...

Program II shows how we'd treat the problem in Basic. We'd simply use a convenient loop variable such as *X* to help calculate the address of the memory location we're poking with an asterisk. After all:

```
STA address
```

does correspond fairly well with

```
?address=value in A
```

The nice thing about Basic, though, is that we can add our variable *X* into things as well, as in line 40:

```
40 ?(&7E80+X)=ASC("*")
```

Wrapping this up in a loop that takes *X* from 0 to 4 guarantees that asterisks appear in locations &7E80 through &7E84.

Fortunately, there are instructions in machine code that allow us to add the value of the *X* register – surprise, surprise – to the value of an address given in that instruction – the base address – to give a third, absolute address.

The STA version of this instruction is of the form:

```
STA address,X
```

The technique is called *absolute indexing*, with *X* being known as the index register or simply the index.

Suppose the accumulator already contains the value for an asterisk – &2A – and *X* has the value 1. Then:

```
STA &7E80,X
```

will place &2A in memory location:

```
&7E80 + 1 = &7E81
```

If, however, *X* has the value 2 then the asterisk ends up in:

```
&7E80 + 2 = &7E82
```

And, of course, if *X* is 0, the asterisk ends up in the base address, &7E80 since:

```
&7E80 + 0 = &7E80
```

So, to get our asterisks to appear in locations &7E80 to &7E84 we need to tie up STA &7E80,X in a loop in which *X* goes from 0 to 4. Successive stores will then be calculated so as to be in &7E80, &7E81, &7E82, &7E83 and &7E84.

Program III does this for us: We initially load the accumulator with &2A and *X* with zero. We then start our loop which – after a STA &7E80,X – increases *X* and checks to see if it's gone beyond our limits.

If not, it loops back to the STA &7E80,X effectively putting an asterisk in the next location along. Then we once more increase *X* and check whether we should loop back.

To explain in rather more detail: On entering this loop, when *X* is zero, we store our asterisk in &7E80+0, and increase *X*. Since our loop's terminating condition isn't met we loop back.

Our STA now places an asterisk in &7E80+1; we increase *X* to 2, loopback to store another asterisk in &7E80+2 and so on.

The check for looping back is quite interesting. We want the store instruction to be performed with *X* from 0 to 4. Since we increase *X* after the STA we need to loop back until *X* reaches 5.

We don't want an asterisk in &7E80+5. We achieve this with:

```
CPX #5
BCC loop
```

As we saw last month, while *X* is less than 5 Carry will be clear since the answer to our imagined subtraction – *X*-5 – will be negative. So we branch back to *loop*.

Once *X* reaches 5 – beyond our range – our imagined subtraction gives a zero result, setting the Carry flag, as it would if the result were positive. We then drop out of our loop to the terminating RTS.

The end result is our five asterisks as in Program I, but indexing in this way allows us to do it in a much neater way.

All right, both involve seven assembly language instructions, but Program III is far more powerful. Which would you find easier to adapt so that there were 10 asterisks on the line?

As you've probably suspected by now, absolute indexing isn't restricted to the *X* register, you can use the *Y* register as well. Hence:

```
STA &78E0,Y
```

is a perfectly valid instruction. Try adapting Program III to use the *Y* register in this way.

Program IV uses absolute indexing

```
 10 REM PROGRAM I
 20 MODE 7
 30 FOR pass%=0 TO 3 STEP 3
 40 P%=&900
 50 [
 60 OPT pass%
 70 .start
 80 LDA # ASC("*")
 90 STA &7E80
100 STA &7E81
110 STA &7E82
120 STA &7E83
130 STA &7E84
140 RTS
150 ]
160 NEXT pass%
170 CALL start
```

Program I

```
10 REM PROGRAM II
20 MODE 7
30 FOR X=0 TO 4
40 ?(&7E80+X)=ASC("*")
50 NEXT X
```

Program II

with the *Y* register to print out our five asterisks, but in a far more efficient manner. As a general rule in machine code, you can often avoid the use of compare followed by branch instructions by counting down instead of up.

By choosing carefully the number we count down from we can often rig things so that we finish our loop when the register reaches zero – and test for this with a BNE. This way we eliminate the compare instruction entirely.

Our programs so far have been concerned with getting a row of five asterisks on the screen and it seems natural to put them there from left to right: &7E80, &7E81 ... &7E84.

There's no special reason for this, though – we could go from &7E84 to &7E80. At the speed machine code does things we're hardly likely to notice the order they appear on the screen.

So Program IV uses the *Y* register to index our STA, counting down. To start we load the accumulator with &2A again, and *Y* with 5.

The latter is purely cosmetic though, as you'll see, for the initial instruction inside *loop* is DEY, so that the first time through the loop *Y* becomes 4 and we store our accumulator at &7E80+4. Following this we check for *Y* having reached zero with a BNE.

The DEY will be the last thing to have affected the Zero flag. Remember STAs, indexed or not, don't affect the Zero flag.

On the first time through *Y* is four, so we branch back to *loop*, decrease *Y* to three, store the accumulator at &7E80+3, check to see if *Y* is zero – which it certainly is not – branch back to *loop* and so on.

Eventually *Y* will be zero when we reach the BNE and we drop out of the loop to our terminal RTS. Before this, however, we will have put an asterisk into &7E80+0, so we'll have got all our asterisks where we want them, right to left, without any need for a compare instruction.

Alright, it's only one instruction, but in loops redundant instructions can often build up into a lot of wasted time...

Incidentally, can you see why I put the DEY before the STA and not after it? If not, try swapping the order of the instructions and then things should become clearer.

There's a natural limit on the scope of absolute indexing: The *X* and *Y* registers can only go from 0 to 255 – or, to put it a generally more efficient way, from 255 to 0 ... Program V shows how to achieve 256 asterisks on the screen, ending up at &7E80.

> ***Avoid the use of compare, followed by branch instructions***

The logic of the program's the same as its predecessor. You shouldn't have any trouble following it provided you remember that if *Y* contains 0 and you then DEY, it will hold &FF.

Program VI also gives us our 256 asterisks, but this time I've put the STA before the DEY. I can get away with this since I'm starting with *Y* holding zero. It does put the asterisks on the screen in a rather odd order though.

When we first enter *loop*, with *Y* containing zero, our asterisk ends up at:

```
&7E80+0=&7E80
```

The DEY then takes *Y* to &FF so the Zero flag isn't set and we branch back to *loop*. This time our asterisk appears "right at the other end" at:

```
&7E80+&FF=&7F7F
```

We then DEY to &FE and branch back so that the next asterisk is stored at &7F7E.

We continue working back like this until we finally enter *loop* with *Y* holding one. Our asterisk now appears at:

```
&7E80+1=&7E81
```

The DEY takes *Y* to zero, so this time we don't take the branch but drop out of the loop. So the last asterisk "printed" is at &7E81 – one character in from the beginning of the line.

This is no problem though since we've already printed the first in the line – at &7E80 – way back at the beginning of the loop.

Absolute indexing isn't restricted to STA operations. We can use them in LDA operations as well, where they appear as:

```
LDA address,X
LDA address,Y
```

Program VII uses STA indexed with the *X* register to perform a simple string handling operation. It inputs a sequence of characters terminating with a Carriage Return (*CR*) and then prints them out in reverse order.

Admittedly this isn't too spectacular,

Turn to Page 130 ▶

```
10 REM PROGRAM V
20 MODE 7
30 FOR pass%=0 TO 3 STEP 3
40 P%=&900
50 [
60 OPT pass%
70 .start
80 LDA # ASC("*")
90 LDY # 0
100 .loop
110 DEY
120 STA &7E80,Y
130 BNE loop
140 RTS
150 ]
160 NEXT pass%
170 CALL start
```

Program V

```
10 REM PROGRAM III
20 MODE 7
30 FOR pass%=0 TO 3 STEP 3
40 P%=&900
50 [
60 OPT pass%
70 .start
80 LDA # ASC("*")
90 LDX # 0
100 .loop
110 STA &7E80,X
120 INX
130 CPX # 5
140 BCC loop
150 RTS
160 ]
170 NEXT pass%
180 CALL start
```

Program III

```
10 REM PROGRAM IV
20 MODE 7
30 FOR pass%=0 TO 3 STEP 3
40 P%=&900
50 [
60 OPT pass%
70 .start
80 LDA # ASC("*")
90 LDY # 5
100 .loop
110 DEY
120 STA &7E80,Y
130 BNE loop
140 RTS
150 ]
160 NEXT pass%
170 CALL start
```

Program IV

```
10 REM PROGRAM VI
20 MODE 7
30 FOR pass%=0 TO 3 STEP 3
40 P%=&900
50 [
60 OPT pass%
70 .start
80 LDA # ASC("*")
90 LDY # 0
100 .loop
110 STA &7E80,Y
120 DEY
130 BNE loop
140 RTS
150 ]
160 NEXT pass%
170 CALL start
```

Program VI

◀ From Page 129

but it does illustrate some interesting techniques – and a lot of genuine application programs fall into the category of string handling.

After a trivial initialisation – LDX #0 – the program divides into three main parts: *input*, *newline* and *output*, (there's structure for you).

Our first problem is where in memory to put the characters typed in until we receive our *CR* that signals we can start to print them out in reverse order.

Well we're already using page &9 to store our code, and there isn't that much code, so we'll use the second half of the page (from &980 onwards) to store our input, christening &980 itself *storage*.

Actually the program doesn't use the location *storage* itself – for reasons we'll see later – because the first thing *input* does is to INX. We then:

```
JSR osrdch
JSR oswrch
```

to read a character from the keyboard into the accumulator and immediately echo it back to the screen. We then store it in memory with:

```
STA storage,X
```

So the first character input ends up in *storage+1* since *X* has value 1 the initial time through the loop. We then check for our terminating *CR* and branch back to input another character if it isn't found with:

```
CMP #CR
BNE input
```

```
 10 REM PROGRAM VII
 20 MODE 7
 30 oswrch=&FFEE
 40 osrdch=&FFE0
 50 storage=&980
 60 CR=&0D
 70 LF=&0A
 80 FOR pass%=0 TO 3 STEP 3
 90 P%=&900
100 [
110 OPT pass%
120 .start
130 LDX # 0
140 .input
150 INX
160 JSR osrdch
170 JSR oswrch
180 STA storage,X
190 CMP # CR
200 BNE input
210 .newline
220 LDA # LF
230 JSR oswrch
240 .output
250 LDA storage,X
260 JSR oswrch
270 DEX
280 BNE output
290 RTS
300 ]
310 NEXT pass%
320 CALL start
```

Program VII

The second time into the loop we INX to value 2 then use *osrdch* and *oswrch* to input and echo a character to screen before storing it in *storage+2* with:

```
STA storage,X
```

We continue in this way, storing successive characters in successive bytes, until we've received – and stored – the terminating *CR*. Once we've got it, we drop through the loop to *newline*.

Printing out the characters backwards couldn't be simpler

Incidentally we've made an assumption here – correctly as it happens – that *osrdch* and *oswrch* don't alter the value of *X*. Can you see how this would affect things?

Anyway *oswrch* and that last *CR* will have ensured that the cursor has returned to the beginning of the line. We then move it down to the beginning of the line below with *newline*, ensuring our output doesn't overprint our input. Given that *LF* stands for Line Feed, I don't think you'll have too much difficulty sorting the routine out.

Now we come to the impressive stuff: Printing out the characters backwards. Actually, this couldn't be simpler. *X* is already "pointing" at the location where we stored our last character – *CR*. We just need a loop incorporating:

```
LDA storage,X
JSR oswrch
```

which repeatedly decreases *X* and we've cracked it. Our decreasing index will copy them out of memory into the accumulator in reverse order.

This is what *output* does. As the value of *X* hasn't changed since the last character input, the first time round *output* the indexed LDA will load in the code for *CR* and print it with *oswrch*, sending the cursor to the start of the line. This matters little since that's where it already is.

The next bit's the heart of the matter, though. We decrease *X* and, provided it hasn't reached zero, branch back to *output* once more. This means that the indexed LDA now retrieves the last character input before *CR*.

This is then output, *X* decreased and the loop back taken if *X* has not reached zero. The indexed LDA now gets its character from where the last character but one before the *CR* was stored and outputs that.

The effect is to print out the stored characters in reverse order.

When the DEX does take *X* to zero we drop through to the RTS, since the Zero flag will be set and the BNE doesn't take effect. If you think about the way *output* works though, you'll see that this means we never print out the contents of *storage*.

The loop can never involve the equivalent of:

```
LDA storage,0
```

since *X* being zero drops us out before we get there. This is no problem though because *input* is organised so that the first character input (and the final output) is stored in *storage+1*.

If you hate waste you might be tempted to alter things to make use of *storage* by moving the DEX to the beginning of *output* and to heck with printing out the unnecessary carriage return.

Unfortunately this assumes that *oswrch* doesn't affect the Zero flag – an assumption we aren't entitled to make. I suggest that if you're so keen to make use of &980, you set *storage* to &97F.

Of course there are lots of ways this program could be improved. Why for instance do we bother storing that final *CR*? Why not just incorporate that sort of detail into *newline*?

The fact is, a lot of computer languages and applications make use of &0D, the value of *CR*, to indicate the end of strings of characters, so involving it here isn't as artificial as it seems.

There are much more serious flaws in the program though, not least of which is the lack of a size restriction on the string we input. After all, we've glibly assumed that we can use page &9 quite happily, but if we input too many characters we'll overflow it and start to store them in page &A.

And even if that's all right, what would happen if we input so many characters that *X* went round the clock from &FF to 0 again? Perhaps you can see why Basic tends to restrict the size of strings to 255 bytes ...

And after all my strictures of last month, I haven't included any safety measures against pressing Escape. So for homework, I'd like you to incorporate a realistic size restriction on the input string and a check for Escape.

If that isn't challenge enough, why not translate the program so that it uses *Y* instead of *X*, and tidy up the code while you're at it?

● *That should keep you busy until next month when, having already covered indexing absolutely, we'll do it indirectly.*

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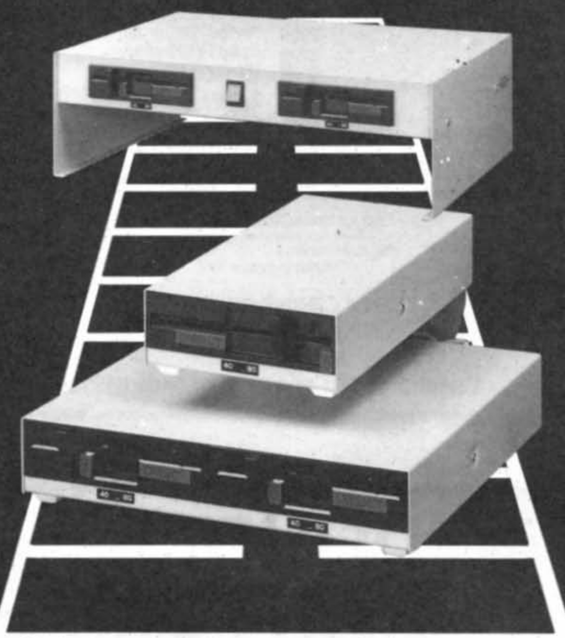

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Power to your printer

Peter Noble looks at the more obscure manuals and deciphers some of the more common printer codes

THE world of computers is steeped in mystery. Now this might be quite enjoyable if the mystery were by design – as in an adventure game – but such is not the case.

The intrigue is entirely a result of badly written instruction manuals which seem to be penned by computer experts who have little expertise in elementary teaching or communication skills.

Either that or the translation from Japanese leaves you guessing at the odd terminology.

Instruction manuals which lack clarity and omit basics are unforgivable but the sin is perhaps understandable: The writers are so well versed in computers that they don't realise how much of their own everyday speech is technical jargon.

Nor do these authors realise that the simplest of facts about computers may be a new concept to many readers.

The Micro User is due considerable credit for attempting to redress the balance. Its plain English articles are very well conceived and written.

With these thoughts strongly in mind I shall approach the knotty problem of printer codes and how to use them.

For those of us new to printing the problem starts as soon as we open the manual – or almost. We learn how to switch on and do some test runs but what on earth do those Escape codes mean and how do we use them with the BBC Micro?

There are certain fundamentals: Firstly character codes 0 to 31 have special effects on the BBC Micro when used in the VDU or PRINT commands, for instance:

```
VDU 22,4
PRINT CHR$(22)CHR$(4);
```

The code 22 forces your micro to use the screen mode of the number which follows it, in this case 4. The two commands have the same effect although the VDU command is obviously simpler.

When you examine most printer manuals you will find that all commands are described in a form similar to:

```
ESC W Enlarged mode setting
      CHR$(27);"W";CHR$(n)
      (n = 0, 1, 48 or 49)
```

This is telling you that the way to get Enlarged mode on your printer is to send a code 27, followed by the Ascii character code for W, followed by a number which can be 0, 1, 48 or 49. In fact 1 or 49 switches this mode on while 0 or 48 turns it off.

This group of commands is called an Escape Sequence because it starts with code 27 – the Escape character. Type this short program into Basic:

```
REPEAT PRINT GET:UNTIL 0
```

Now try pressing various keys except Escape, Break and the cursor keys. You will see different numbers coming up – these are the character codes for the keys you are pressing.

Finally press Escape. The very last number printed is 27 – the code for Escape.

So how do you produce an Escape Sequence on the computer if you can't press Escape? Try:

```
PRINTCHR$(27)"W"CHR$(49)"Hello"
```

What you should get is W1Hello printed on your screen. Nothing happens on the printer because it's not switched on. Now try this:

```
VDU 2:PRINT CHR$(27)"W"CHR$ (49)"Hello"
:VDU 3
```

The VDU 2 command allows the control codes to be sent to the printer. You still get W1Hello on the screen, as will the printer – but not enlarged.

This is because the BBC Micro intercepts code 27 and doesn't let it through. VDU3 stops your next output going to the printer.

Character W has the code 87 so to simplify the codes by just using VDU, try:

```
VDU 2,27,87,49:PRINT"Hello":VDU 3
```

And finally to make the screen agree with the printer we add one more refinement – control code 1. This sends the

Turn to Page 134 ▶

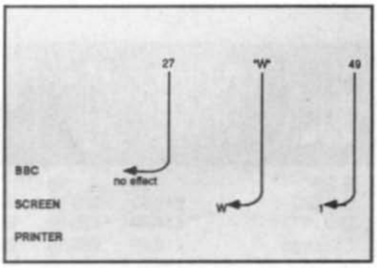


Figure I: PRINT CHR$(27)"W"CHR$(49)

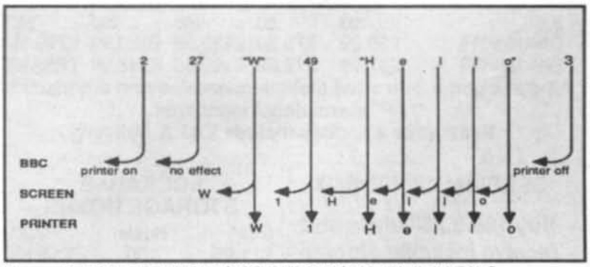


Figure II: VDU 2:PRINTCHR$(27)"W" CHR$(49)"Hello":VDU 3

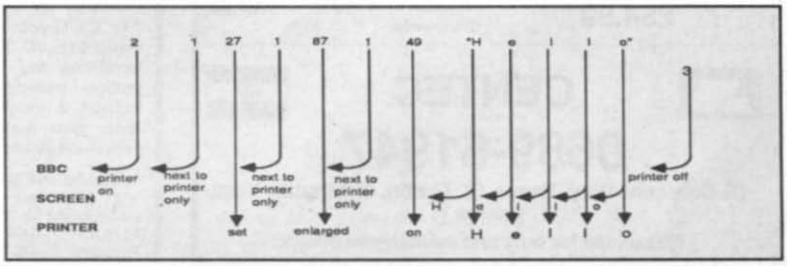


Figure III: VDU 2,1,27,1,87,1,49:PRINT"Hello":VDU 3

◀ *From Page 133*

number following to the printer only, not to the screen:

```
VDU 2,1,27,1,87,1,49:PRINT"Hello"
:VDU 3
```

See Figures I to III for a diagrammatic representation of where each code is sent and the effect it has.

If we want underlined, emphasised, enlarged script, the code is daunting:

```
VDU2,1,27, 1,45,1,1, 1,69, 1,87,1,1
```

The gaps identify the separate parts, but needn't be inserted in use.

If that lot frightens you it's a good excuse for investing in a versatile word processor.

For simplicity I'm now going to assume that you have either Mini Office II, Wordwise or Wordwise Plus fitted because each package simplifies the VDU commands.

In Mini Office II you have the CC (Control Codes) command which is similar to the Basic VDU command except that you don't need to put in the 1s.

In Wordwise this command is OC (Output Codes):

```
CC 27,87,49
OC 27,87,49
```

In Wordwise Plus there is the even simpler command ES (Escape Sequence). This automatically sends code 27 so all you need is:

```
ES 87,49
```

But not all printer commands start with code 27, so make sure you are using the correct word processor command.

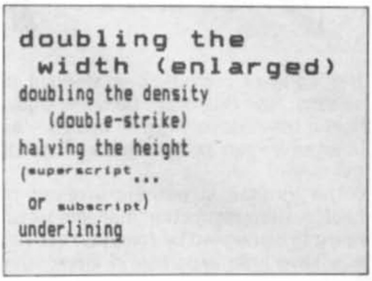
Now you know how to enter your control commands to the printer but as you play with the various options you soon discover that some of them don't seem to work all the time.

The new problem is one of priorities and groups of commands. The priorities are not at all democratic or even simply queued. There is a distinct pecking order to the types of print available.

The print styles consist of four basic types with several modifying options. The basic type can be Pica, Condensed, Emphasised or Elite. Pica is the default setting – the one selected at switch on.

These types are quoted in ascending order of priority. Thus if you select Emphasised and Elite together, Emphasised is over-ridden and only appears when Elite is cancelled. The others interact similarly.

Having selected the basic type we can modify it. The simplest modifications are:



doubling the width (enlarged)
doubling the density
(double-strike)
halving the height
(superscript...
or subscript)
underlining

We can also go *italic* which is really a completely separate type but it is selected as simply as any of the modifications.

● *Well, that's the end of this introduction to printer codes and how to unleash their power. I hope that it will help you upgrade your output.*

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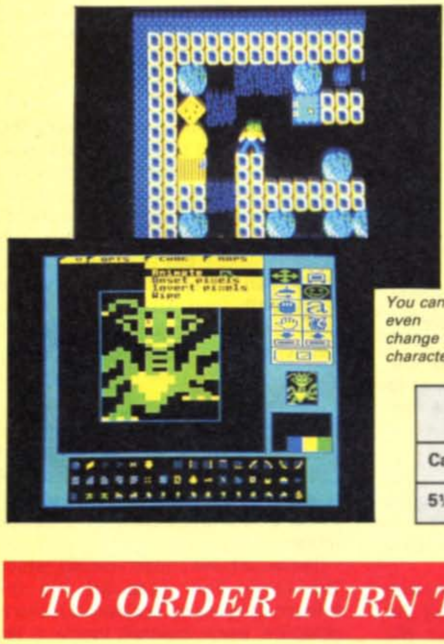

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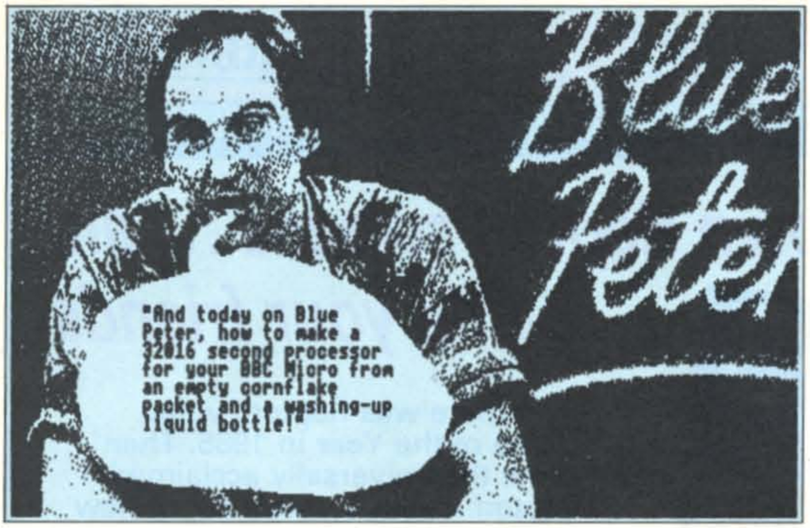
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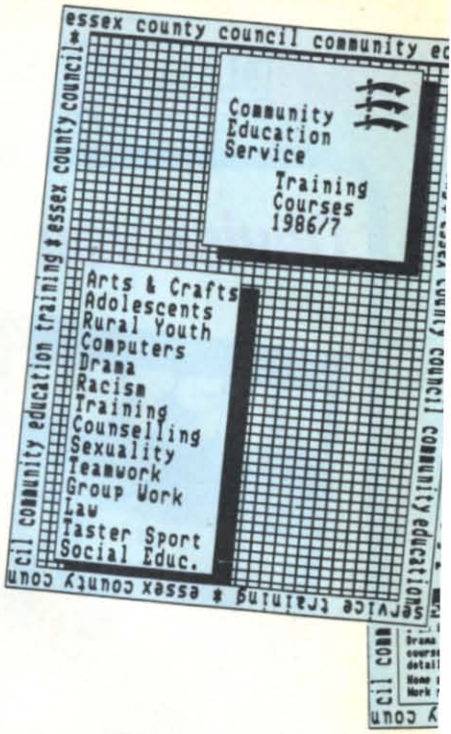
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HINTS & TIPS

Compiled by Dave Watts

IN my work as a training officer with a local authority, where I often have to produce worksheets, handouts, teaching aids and publicity materials, Advanced Memory Systems' Pagemaker earned its keep after the first few pages. I've even prepared an excellent 80 page training manual with it.

Originals can be fed through a heat-copier or photocopier to provide very professional overhead projector transparencies, or the page photographed to make slides.

With the help of John Simpson, technical adviser at AMS, I have put together some hints and tips.

Mouse lore

● I found out the hard way that the Mouse rom – but not the Pagemaker roms – must be above the DFS in priority. Pagemaker Plus contains the mouse drivers itself, so the problem doesn't arise.

Compatibility

● With so many manufacturers now producing add-ons for the BBC Micro, problems of compatibility are on the increase. Some DFSs will not initialise Pagemaker Page discs at all, due to the mysterious operation of osword &7F. Generally all the Acorn DFS versions are ok, as are the Watford DDFS and single density DFS, but Opus 3.45 owners must ask Slogger for the 3.46 or 3.16 versions. The Solidisk issue 2 FDC board and 2.2 DFS are fine, but not the 2.1. If your DFS will not initialise a Page disc you can send AMS a blank disc which they will initialise and you can make more copies using *BACKUP.

The software will not run in a machine which has Econet fitted, but again if you send AMS a blank disc they'll send you a "fix" to turn the NFS off.

Faster fonts

● If you have a double sided drive it's faster in use if you copy the fonts on to the back of the system disc, but be careful.

Take off the write-protect tab, format the back of the system disc, back up the Font disc on to it checking your drive numbers carefully, then replace the write-protect tab. Now you don't have to change discs whenever you want a new font.

Bordering on the simple

● Designing a border round an A4 page can be tedious as you have to do it in three stages, only part of the page being on the screen at a time.

Once you get a good one it's worth using the Duplicate facility to copy the border on to the other pages on the same disc for future use. The same goes for standard headings and so on.

Pages discs

● Backing up Page discs provide a faster alternative to the slow disc initialising program provided as part of the set-up suite.

Simply initialise one disc, then back it up on to other formatted discs – it's much quicker than initialising discs individually.

Catalogue care

● Be very careful when swapping Page, Cutout and Text discs. The catalogue of a Page disc is easily corrupted if you accidentally try to save a cutout on to it.

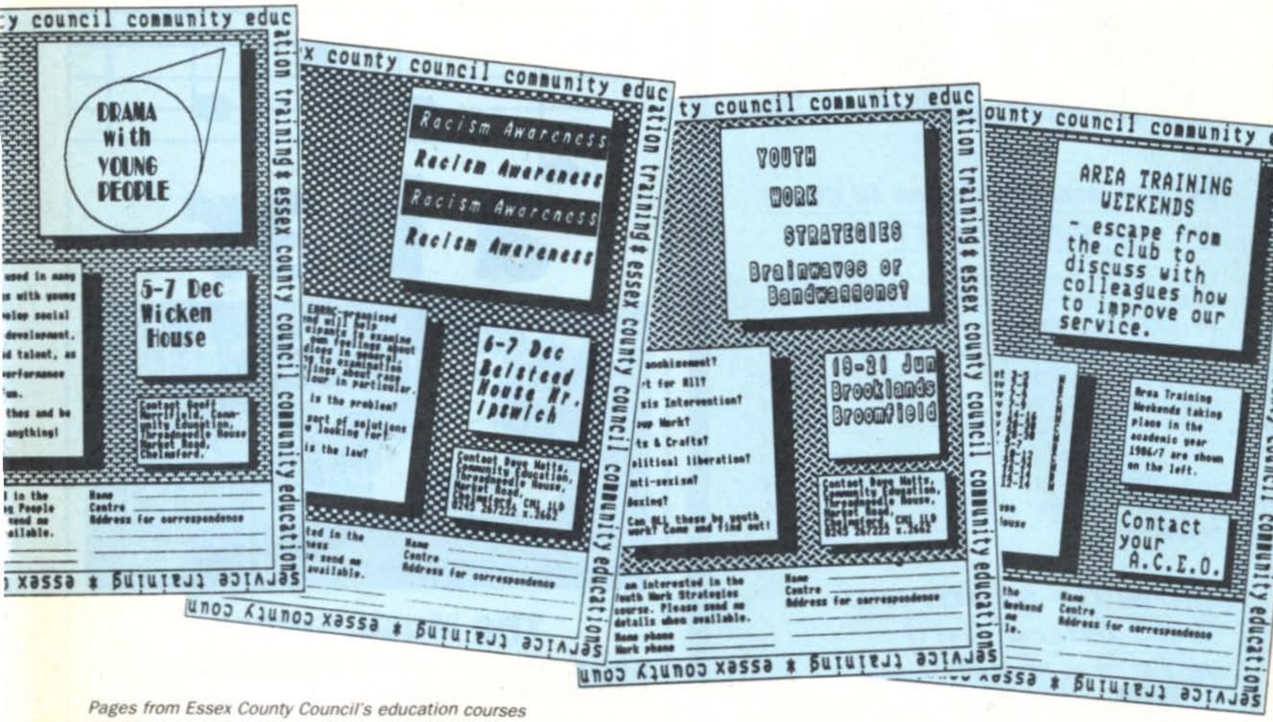
The catalogue of pages on a disc then appears as gibberish, although if you point to where the title ought to be on the screen and click the mouse the page will usually load. Loading and resaving each page should reconstruct the catalogue.

Fonts mods

● Designing your own fonts requires an artistic sense that was way beyond me, but I discovered that very acceptable results can be obtained by loading in an existing font and modifying it, letter by letter.

I invented one called THICKO, which is the Large font with all the lines thickened by a pixel or two. It looks very effective when inverted inside a black box.

I also managed to create a font in



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Pages from Essex County Council's education courses leaflet showing a variety of fonts and backgrounds

which none of the letters have curves, so that they can be enlarged without getting the "stepladder" effect. AMS promises some new fonts and cutouts too, along with assorted utilities, on two flippable discs called Extra!

One of these utilities converts Superart fonts into Pagemaker fonts and vice-versa, but perhaps the best utility lets you boot straight into your page without wading through all those set-up screens first. Unfortunately, to benefit you must own Pagemaker 1.3 or better.

Downloading pictures

● Discs of pictures for loading into Pagemaker are available from several sources now. An exciting new source for Pagemaker and Superart graphics is Exchange & Art on Tubelink (Prestel page 25821826), where screens and fonts are available for downloading.

At the time of writing there are some superb Mode 1 screens up for grabs, plus three fonts.

Blotting out bloops

● There are at least five different ways of erasing your mistakes. For tiny corrections the Zoom facility is best. For smallish errors try painting over it with white, picking a suitable brush size on the Quick Click window.

To get rid of larger mistakes use Copy to define a white area of the page to copy over the mistake and for those really big corrections define a window and Clear it – this will also clear a whole screen if no window is defined. Detailed text erasure can be achieved by picking white from the Quick Click window and overtyping the black with white.

Printer dumps

● Users with some printers have found that none of the printer dumps supplied will persuade their errant machines to work. AMS is working at writing dumps for as many printers as possible. Send AMS your system disc to get your printer dump copied on to it.

Digitised TV

● A few words about the use of a video digitiser with Pagemaker. This is wonderful fun, both capturing images off live TV and digitising the output from a video camera. I used the Watford one which lets you store Mode 0,1 or 2 screens on disc.

Pagemaker will convert Mode 1 or 2 screens into Mode 0, the only one it likes, but I've found that the best results are obtained by digitising directly in Mode 0.

When you load a digitised screen into the package it is in negative form, so you have to invert it with the Window Invert command. Then you can manipulate the image to your heart's content.

When capturing TV images, usually using the video out socket on the back of a video recorder, some programmes digitise better than others. Cartoons give almost perfect results, so if you like the Flintstones or Danger Mouse then this is for you.

Real people are harder, particularly if contrast is poor. Remember that the edges of the picture will be lost when loaded into Pagemaker, so allow for it. Digitising off live TV works best. Using a video recording as source often gives horizontal black lines on your picture, from the oxide drop-out on the tape, although this can be repaired using Pagemaker's graphics facilities if the damage isn't too serious. Commercially recorded tapes seem less prone to drop-out that home recordings.

Transfer dumps

● Underware Transfer Ribbons from Banbury Computer Services lets you print out screens or pages on to ordinary paper, making a transfer which can be ironed on to garments. I've used this with mentally handicapped students to great effect.

Of course the image has to be printed backwards, as it will be reversed again when ironed on, but the Flip facility takes care of this. The results are not as good as professional fabric printing but still good fun.

Using the AMX Pagemaker is both enjoyable and profitable once you have got to grips with its finer points. I hope the hints here will guide you on an easier path to effective page making. ■

The truth about TELEX

How much does it cost to go on Telex?

You could go the conventional way and buy a dedicated Telex machine. The cheapest will cost you £1,604 (the Whisper), the dearest £2,892 (the Cheetah). You will also need a separate telephone line, costing £101 to install, plus £404 a year rental. That's a total outlay over the first year of a minimum of £2,109. (All prices include VAT.)

Or you could do what more and more micro users are doing – use your BBC Micro to double as a Telex machine. And just use your ordinary telephone!

How do I turn my BBC Micro into a Telex machine?

All you need is a modem and appropriate communications software (see the advertisements in this issue), a telephone, and a subscription to *MicroLink*.

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But there's a big bonus you get when you use *MicroLink* for Telex that the conventional way doesn't offer.

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MicroLink application form: Page 55

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Trevor Roberts

examines pseudocode

Cracking the code

"I'M one of those programmers who spends more time thinking about their programs than actually sitting at a keyboard typing in code.

I plan them in a thoroughly logical, efficient way. I make sure that they are completely structured and that a GOTO never raises its ugly head. I also tell lies."

Pseudocode is a Program Design Language (PDL) which is just a posh way of saying that it's a tool that can be used to create and describe programs. But it's not a language like Basic or Pascal where you have to learn a whole new syntax before you can use it.

In fact it's the opposite. As we'll see, it just consists of a description of a program in normal English held together with a few uncomplicated rules.

Because of this it's easy to learn and simple to use and understand. Yet using it helps produce logical, structured, error-free programs. And it's all to do with algorithms.

Whether you realise it or not, whenever you've written a program you've produced an algorithm. It is just a set of actions to be taken to achieve a desired result.

We use them all the time; they're not confined to programming. Knitting patterns are algorithms, as are musical scores and kitchen recipes. In fact almost anything that tells you how to do something, from a DIY manual to a book on Yoga, consists of algorithms – the steps and rules to be followed to achieve a desired result.

Armed with the fact that you've used algorithms all your life you should now feel confident enough to tackle the algorithm in Figure I. This is the algorithm for having a drink in a pub or coffee bar. It's written in plain English and is, I hope, easy to follow. Which proves my earlier point, because it's written in pseudocode.

```
go to bar
buy drink
consume drink
```

Figure I: An algorithm to drink to

```
be born
live
die
```

Figure II: The algorithm of a lifetime

```
initialise
calculate
output
```

Figure III: An all-purpose algorithm

Thinking about the algorithm in more detail, there are some important points to grasp.

Obviously it consists of three instructions. And obviously they are to be performed one after the other, starting at the first line and finishing at the last.

But take a closer look at each instruction. Each consists of a single, simple action – "go to bar", "consume drink". Each starts with a verb, the "doing word" beloved of English teachers, and each is a brief but readily understandable description of what is to be done.

And that, in essence, is pseudocode. It's a set of simple statements, one after another, giving instructions on what to do in a rather stilted but nevertheless comprehensible form of English.

Moving on from the bar (to which we'll return later, do not fear) have a look at the pseudocode in Figure II.

This algorithm should be published as a novel, it says all there is to say about the human condition. Yet it does it briefly and precisely in three steps, each step to be taken one after the other. Having said that, most of us try to avoid the last instruction.

"But what about programming?" you may be asking. "These algorithms have nothing to do with my micro", you may protest. The pseudocode in Figure III shows something more relevant.

Most programs consist of the three steps shown. There's usually a part that deals with setting things up such as opening files or requesting keyboard input, initialising variables and so on.

This is followed by the bit of the program that actually does the work, followed in turn by the part that returns the required results to the user. And the pseudocode in Figure III shows this process, clearly and concisely. It also leads on to another aspect of pseudocode and algorithms.

```
stand up
leave table
head towards counter
stop at bar
catch eye of barman
order round
pay for drinks
stop crying
consume drink
```

Figure IV: A more detailed algorithm

I've said that each pseudocode statement should be a brief description of a simple action. Well, the descriptions in the pseudocode of Figure III are probably a little too brief.

After all they could apply to anything and, as they stand, are no use for a specific program. What we need is a way to elaborate on these elementary but rather vague statements so that we have a better idea of what they do.

Pseudocode allows us to do this by the simple method of allowing each single statement in turn to be turned into another set of pseudocode instructions.

To return to the bar as promised, let's look at each statement in turn. You might think that:

```
go to bar
```

needs no further explanation but all that means is that you haven't met our editor. For him we need to write:

```
stand up
leave table
head towards counter
stop at bar
```

and with:

```
buy drink
```

becoming:

```
catch eye of barman
order round
pay for drinks
stop crying
```

As for:

```
consume drink
```

we can leave it as it is. He knows that bit all too well.

From this admittedly silly example, you'll see that pseudocode allows you to start with simple descriptions of what you want doing and then move into more complicated ones as the need arises.

Putting all this down on paper brings us to another of the principles behind pseudocode.

Suppose that you'd broken down our bar algorithm's statements into simpler components as shown above. How would you write the new algorithm? One way would be to put the more detailed descriptions in the place of the less detailed ones. Figure IV shows the results of this substitution.

While this works, it's not very clear is it? You could follow it step-by-step but trying to grasp the overall styructure, seeing how the thing works, becomes quite difficult. A rather better way of adding the more detailed instructions is shown in Figure V. Here the earlier

Turn to Page 140 ▶

◀ **From Page 139**

algorithm is shown in full, but without all the added details. The more precise instructions for each step are given later on in the pseudocode. Each of these "mini-algorithms" is shown under the instruction it is elaborating.

The pseudocode still reads from top to bottom, one instruction at a time as before. However if an instruction needs expanding you "jump" to the more detailed description of that step. This is worked through line-by-line and when it's finished you go back to the next instruction in the main algorithm.

So with Figure V you read:

```
go to bar
```

and then look to the mini-algorithm entitled "go to bar" to see precisely what this means.

Once you've worked through this step-by-step, you return to the first piece of code and do the next instruction:

```
buy drink
```

This in turn sends you off to another, more detailed set of instructions. And if this gets you thinking of subroutines and procedures, full marks.

One thing to grasp is that although the layout of Figure V is different from Figure IV, the actual instructions performed are the same.

However, the pseudocode of Figure V is much easier to understand. The first three lines give an indication of what the whole thing is about while the others give more details if required.

You can see the wood and then to hunt down individual trees. Notice how the underlining of the mini-algorithms' titles and their indentation helps make the scheme of things clearer.

And anything that makes an algorithm clearer helps with programming. Yet there are a lot of questions remaining.

Suppose that our editor didn't understand:

```
pay for drinks
```

and needed to be told exactly how to do it such as:

```
open wallet
pass over money
receive change
```

How would you fit this into the pseudocode? Would you just substitute the instructions for "pay for drinks"? Or would you use another mini-algorithm? And how would you show this? And suppose, unlikely though it be, that the editor bought another round? How would you deal with the repetition?

```
go to bar
buy drink
consume drink

go to bar
stand up
leave table
head towards counter
stop at bar

buy drink
catch eye of barman
order round
pay for drinks
stop crying
```

Figure V: Same algorithm, different style

As these questions show, there's a lot more to pseudocode than we've dealt with here. We'll cover them in the next three articles. As it is, try using the simple pseudocode structure shown here to plan your programs.

While it may seem a bit strange at first, I have little doubt that you'll find that it makes your programming easier.

● *Next time we'll be looking at how pseudocode deals with decisions.*

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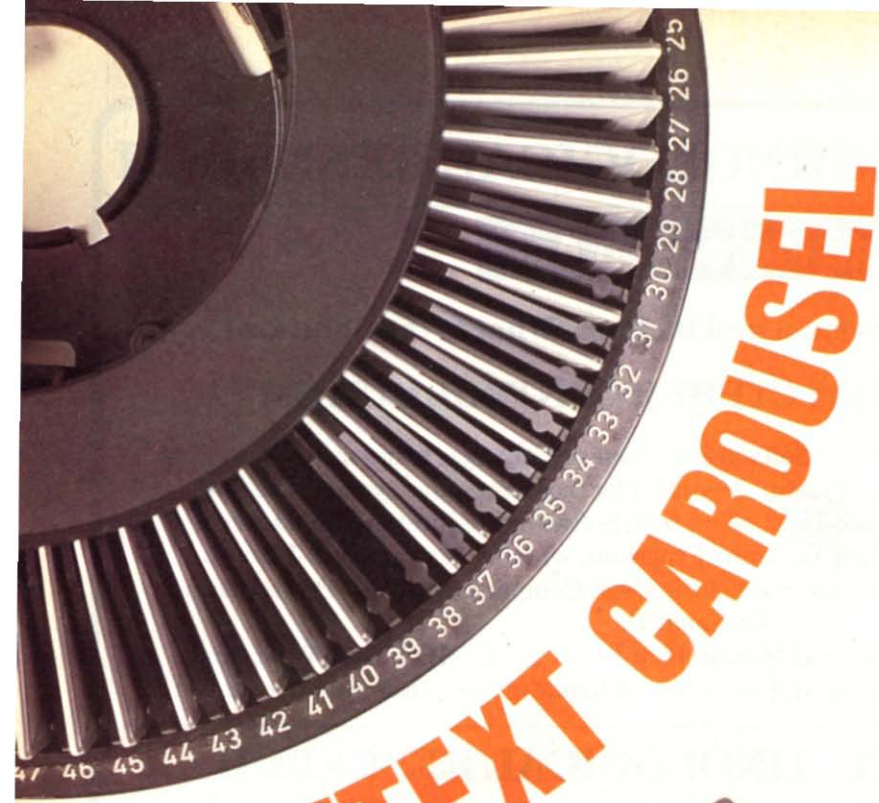

TELETEXT CAROUSEL

Peter Vasey offers a program that takes one frustration out of Teletext paging

TELETEXT multiple pages sometimes change too fast to read in full and if you use the hold option you often miss the next page – Newsreel, Micro News, Holiday and Index pages are all frustrating examples of this.

If you are using your micro and a teletext adapter to download pages you have a far more flexible way to view pages than with a standard teletext television.

For those of you with a Morley Teletext Adapter, this utility stores all the sub pages allowing you to view them at leisure on a carousel. It uses Morley's own commands, but can be easily adapted to other systems.

Type in the program and save it before running in case you have made a mistake in one of the commands and you download a page on top of your program.

With the program running at Page &1900, you will be able to store up to 21 sub pages in ram. Running at &1100 allows 23 sub pages.

This will be enough for most multiple pages, although some – holidays for instance – can exceed this. In those cases I recommend you save the page as two or more files using the save option from the menu.

You can also load and save pages to disc – no more waiting for the index. The cassette filing system is very slow and inflexible for storing the pages, but cassette owners can still use the program to view the multiple page of their choice.

One or two sections of the program need explaining. *FNC*, line 850 is linked to the SUBCODE command. Quite often Teletext pages are broadcast twice to allow time for reading.

If the loop counted by *P%* in line 390 was incremented after each page was received, twice as much memory would

```
   10 *K.10
   20 REM TELETEXT CAROUSEL
   30 REM By Peter Vasey
   40 REM (C) The Micro User 1987
   50 REM For Morley Adapter V.2a
   60 REM*************************
   70 *TV255
   80 MODE7
   90 store%=1+((TOP+&200)DIV256)*256:N%
=0
  100 DIMCH$(3),S%40:FORA%=0TO3:READCH$(
A%):NEXT
  110 ONERRORIFERR<>17ANDERR<>4VDU7:REPO
RT:PRINT'"Please press RETURN";:REPEATUN
TILGET=13
  120 *FX4,1
  130 PROCTITLE
  140 FORA%=4TO5:PRINTTAB(9,A%)CHR$141CH
R$131"Menu":NEXT
  150 PRINT'"1.  Load Page from Disc"
  160 PRINT'"2.  New Page from Teletext"
  170 PRINT'"3.  Save Page to Disc"
  180 PRINT'"4.  Scan Current Page"
  190 PRINT'"5.  Quit Program"
  200 FORA%=0TO5:PRINTTAB(2,5+A%*2)CHR$1
34:NEXT
  210 PRINT'"Please select choice ";:REP
EATA=FNG-16:UNTILA>0 ANDA<6 ORA=-6
  220 IFA=-6PROCSTAR:GOTO130
  230 Y=VPOS:PRINTTAB(2,5+A*2)CHR$136CHR
$135TAB(0,Y)CHR$152
  240 IFA=1PROCLOAD:GOTO130
  250 IFA=2PROCNEW:GOTO130
  260 IFA=3PROCSAVE:GOTO130
  270 IFA=4PROCSCAN:GOTO130
  280 IFA=5:IFN%<>0VDU7:PRINT"Save curre
nt Page? ";:REPEATA=FNG:UNTILA=78ORA=89:
IFA=89PROCSAVE
  290 VDU26,12:*FX4,0
  300 END
  310 DEFPROCNEW
  320 PROCSURE:PROCTITLE:VDU26
  330 PRINTTAB(0,5)CHR$131"Which Channel
? "CHR$135;:FORA%=0TO3:PRINTTAB(17);A%+1
;"=";CH$(A%):NEXT:PRINT'TAB(20)"? ";
  340 REPEATA=FNG-17:UNTILA>-1ANDA<4:VDU
8,8,8:PRINTCH$(A)
  350 PRINT''CHR$131"Please enter Page N
umber"CHR$135;:INPUTP$
  360 max%=(HIMEM-&100-store%)DIV&400:PR
INT'CHR$131"How many sub pages (max ";ma
x%;")"CHR$135;:INPUTN%:IFN%>max%ORN%<1:V
DU7:PRINT'"OUT OF RANGE":GOTO360
  370 PROCOSCLI(CH$(A))
  380 PRINT''CHR$134"SEARCHING":C%=9999
  390 FORP%=0TO N%-1
  400 PROCOSCLI("PAGE "+P$+"00XX")
  410 *SUBCODE
  420 IFC%=FNC THEN400ELSEC%=FNC
  430 *SEE
```

This is one of hundreds of programs now available FREE for downloading on MicroLink

PROCEDURES

TITLE	Prints Header and sets screen window.
LOAD	Loads page from disc.
NEW	Loads page from transmission.
SAVE	Saves page to disc.
SCAN	Scans page in memory.
OSCLI	For Basic 1 users, emulates the Basic 2 OSCLI command.

MORLEY TELETEXT COMMANDS

***SUBCODE**	Returns binary coded decimal sub page number to bytes &C19 (LSN) and &C1A (MSN). Thus if the contents of &C19=2 and &C1A=1 the subpage number is 12.
***BBC1**	Selects channel.
***PAGE nnnmmmm**	Selects page number nnn and subpage mmmm. X= wild card. So you can have:
***PAGE 11900XX**	selects the next broadcast subpage of page 119.
***SEE**	Displays the page currently in the adapter's memory.
***TRANSFER nnnn (HEX)**	Transfers the page currently in the adapter's memory to address nnnn.
***DISPLAY nnnn (HEX)**	Displays the page stored at address nnnn.

be needed to store all the pages. So a check is made in line 420 to ensure that a new page has been received before proceeding.

Line 90 makes sure that there is sufficient variable workspace between the end of the program and the start of the page store, and line 360 sets the maximum number of pages allowed, again reserving space below *HIMEM* for the stack.

One byte is reserved at the very beginning of the page store to record the number of sub pages. This is required if the page is reloaded from disc, and is read in line 510.

Line 620 checks to see whether the file to be saved already exists and if so gives a prompt. It works by attempting to open the file for reading. If the file does not exist the channel number returned is 0, and this is acted on.

CLOSE#0 simply closes the file again to avoid a file open error. This check should be left out for cassette users.

The program is menu driven and easy to use. Once a multiple page is in memory, either downloaded or from disc, select menu option 4 to view the pages.

Press the spacebar to get the next page on an endless loop, and Return to get back to the menu at any point. The files are stored in directory T and this is looked after by the program, so if you want a file stored under T.FILE just enter FILE when requested.

Escape will return you to the menu, and all other errors are reported except for Mistake (error 4) which is used in line 570 to return to the menu without getting snarled up in active procedure loops. Until the program is fully debugged I recommend you leave the following check out of line 100:

```
ANDERR<>4
```

The number of sub pages for any given page can vary from day to day. If you do not know the current number, just make a guess. As soon as the first page has been downloaded you can read the number of sub pages, press Escape and start again.

This is preferable to having the program read the number directly, since there might be too many sub pages to store in one block.

PROCSTAR allows you to use star commands when in the menu, so if you get the dreaded Disc full message you will be able to delete a file or change your disc and try again. Don't try *COMPACT though – you will lose everything. You can catalogue your disc if you cannot remember the contents.

An important use of this is that you can call the Teletext commands directly from the menu. So if you have loaded an Index page, you can then type in *PWAIT <page no.> to view any page you wish without losing the Index.

I have found this program very handy and now use my Teletext Adapter a lot more often, and it works on the Master as well – so join me on the Carousel. ■

```
  440 PROCOSCLI("TRANSFER "+STR$~(store%
+P%*&400))
  450 NEXT
  460 VDU7,7,7,12:PRINT'"Page now store
d in memory.":PROCRETURN
  470 ENDPROC
  480 DEFPROCLOAD
  490 PROCSURE:INPUT"ENTER LOAD FILENAME
: "F$
  500 PROCOSCLI("L. T."+F$+" "+STR$~(sto
re%-1))
  510 N%=store%?-1:ENDPROC
  520 DEFPROCSTAR:REPEAT
  530 INPUT'"*"F$:Y=VPOS:VDU26:PRINTTAB
(0,Y)
  540 PROCOSCLI(F$):*FX15,0
  550 PRINT'"Hit a key ";
  560 UNTIL GET<>42:ENDPROC
  570 DEFPROCSURE:IFN%<>0VDU7:PRINT"Are
you Sure? ";:REPEATA=FNG:UNTILA=78ORA=89
:PRINT':IFA=78MENU
  580 ENDPROC
  590 DEFPROCSAVE
  600 IFN%=0PROCPAGE:ENDPROC
  610 store%?-1=N%:INPUT"ENTER SAVE FILE
NAME: "F$
  620 X%=OPENUP("T."+F$):CLOSE#0:IFX%<>0
:VDU7:PRINT"FILE EXISTS - SAVE OVER IT?
 ";:REPEATA=FNG:UNTILA=78ORA=89:VDUA:IFA
=78PRINT'"File NOT saved":PROCRETURN:EN
DPROC
  630 PROCOSCLI("S. T."+F$+" "+STR$~(sto
re%-1)+" "+STR$~(store%-1+N%*&400))
  640 ENDPROC
  650 DEFPROCSCAN
  660 IFN%=0PROCPAGE:ENDPROC
  670 VDU26,12:PRINT'"PRESS"CHR$134"CUR
SOR UP/DOWN"CHR$135"TO VIEW"'TAB(13)CHR
$134"RETURN"CHR$135"FOR MENU"
  680 P%=0
  690 REPEATA%=GET:UNTILA%=138ORA%=139OR
A%=13:IFA%=13ENDPROC
  700 IFA%=138P%=P%+1:IFP%>N%-1 P%=0
  710 IFA%=139P%=P%-1:IFP%<0 P%=N%-1
  720 PROCOSCLI("DISPLAY "+STR$~(store%+
P%*&400))
  730 *FX15,0
  740 GOTO690
  750 DEFPROCPAGE
  760 VDU7:PRINT"NO PAGE IN MEMORY."
  770 DEFPROCRETURN
  780 PRINT'"Please press RETURN";:REPEA
TUNTILGET=13:ENDPROC
  790 DEFPROCTITLE
  800 VDU12,28,5,24,39,0:FORA%=1TO2:PRIN
TTAB(2,A%)CHR$141CHR$148CHR$157CHR$131"T
eletext Carousel  "CHR$156:NEXT
  810 ENDPROC
  820 DEFPROCOSCLI(M$)
  830 $S%=M$:X%=S%:Y%=S%DIV256:CALL&FFF7
  840 ENDPROC
  850 DEFFNC=?&C19+10*(7AND?&C1A)
  860 DEFFNG=GETAND223
  870 DATA BBC1,B
```

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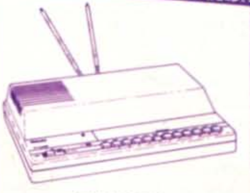

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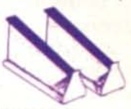

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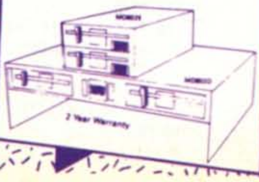

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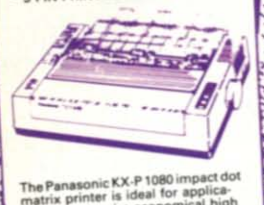

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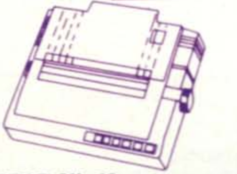

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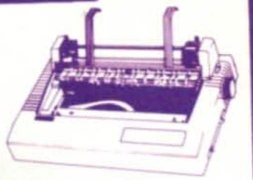

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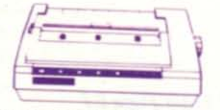
17" Wide carriage . 136 column, operating at 160 cps and at the push of a switch will print near letter quality at 40 cps. Fully Epson and IBM compatible. 8k of standard buffer built in. Standard Centronics are optional RS232 **£379.00**

SOURCE

The Complete Solution

INTRODUCES THE NEW TECO VP1814



Dot matrix printer. VP1814 is fast highly reliable and easy to operate.

☆ Standard 80 column

☆The high-speed, low energy consumption 9 wire dot head gives printing speed of 189 cps and NLQ speed 36 cps

☆Bi-directional, Logic seeking in text mode

☆The use of fan-fold, roll or cut-sheet paper is possible with adjustable sproket pin feed and friction feed

☆Offers emphasized, double print, super script, sub script

☆Justified print mode are also available including left, centre, right and full justification

☆9 graphic modes are available

☆Both download and inprint buffer can exist simultaneously

☆7K input buffer standard can be expanded to 15K

☆Printing modes selectable at front panel (NLQ/draft, Pica/Elite, enlarge, emphasize, condense, italic

☆11 Language international character font is internalized

☆Both IBM and Epson compatable

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SPECIAL INTRODUCTORY PRICE
(inc. VAT) **£229.00**

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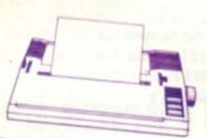

EPSON LX86

High performance low on price offering an increased performance at an incredible low price. The LX 86 Dot Matrix Printer represents unprecedented value for money, with a host of built in features, increased draft speed 120 cps and correspondence quality at 16 cps printing this versatile Epson printer carries out every task with effortless style and has the highest standard of reliability. Supports both Epson and IBM character set. (inc VAT)£229.00

DOT MATRIX PRINTERS

Juki 5510 - Gives you 180 CPS & NLQ Standards
£269.00 Inc. VAT

...and thats not all! The Juki 5510 also has full graphics mode, two position 'dip-switch' (providing instant compatibility with both the Epson and the IBM Graphic Printer). Standard 2K memory (expandable to 14K) built-in Parallel Centronics interface and 8-switch international character sets. If you need colour too, the optional Juki 5510 Colour Kit gives you seven colours. **£112.00**

MICRO P MP165

80 Columns. 165 cps in draft mode. 35 cps in NLQ mode. Ultra high resolution graphics. Friction and traction feed. Compatible with all major micros. Quiet and easy to use. 2 Year warranty. Epson or IBM compatible control codes. **£199.00**

MP200

200 cps in draft. 40 cps in NLQ mode. 7K buffer as standard (128 downloadable characters in NLQ) optional 8K memory. IC font cards. Auto insert—Loads paper automatically to top of form. User friendly control panel—easy print pitch selection. I/F board—quick change of interface to match applications. Cut sheet feeder (optional double bin auto sheet feeder). IBM compatuble. **£274.85**

MP201

Same as MP200 with 136 columns **£318.55**

CANON PW1080A

80 column printer with 160 cps draft and 40 cps NLQ with built in friction and tractor feed. Fully compatible with Epson FX80. Standard parallel interface. **£235.00**

DAISYWHEEL

PANASONIC KX-P3131

A Fully Formed Serial Impact Daisywheel printer with print speed of 17cps. Diablo compatible print wheels. Print pitches available are: 10, 12, 15 and proportional spacing. Standard friction feed and optional tractor. Paper width 13.5 inches. Standard Centronics optional RS-232C. Built with 6K text buffer expandable to 32K buffer. **£251.30**

QUENDATA DWP 1120

with optional tractor/sheet feeder and 13" paper width facility. This Daisywheel printer with 20 CPS has 96 character printwheel compatible with the QUME. Standard centronics interface. (optional RS232 C) **£169.00**

Juki 6100	£285.00
Juki 2200	£275.00
Juki 6300	£799.00

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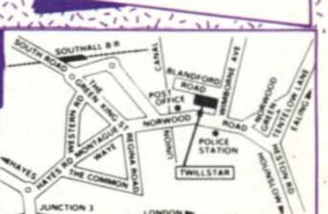

◄ From Page 57

```
  40 REM ******* DINO *******
  50 REM and the saurus races
  60 REM by Gordon J. Key
  70 REM (c) The Micro User
  80 *FX3
  90 *TAPE
 100 IFTOP<&3000 MODE2ELSEMODE7:PROCsho
rten
 110 PROCinit:PROCg:END
 120 DEFPROCg:REPEAT:PROCstart:REPEAT
 130 VDU26:PRINTTAB(1,30);:COLOUR(3+(S%
DIV9)*2)MOD9:COLOUR132
 140 FORT%=0TOS%MOD9:VDU144:NEXT
 150 A%=EVAL("FNscr"+STR$(S%MOD9))
 160 IFA%=TRUE:PROCend:UNTILTRUE:UNTIL0
 170 IFNOTA%S%=S%+1ELSES%=0
 180 UNTILA%=TRUE:UNTIL0:ENDPROC
 190 DEFPROCstart
 200 VDU19,12,8;0;19,13,15;0;17,128,28;
20,19,10,12,17,132,28;31,19,29,12,26,18;
7
 210 MOVE0,92:DRAW1280,92:L%=4:S%=0
 220 GCOL0,2:MOVE0,712:DRAW1280,712
 230 MOVE0,716:DRAW1280,716
 240 PROCprntsc:PROCgetspc:C%=10
 250 X%=148:Y%=208:CALLQ%,C%,X%,Y%
 260 PROCdash:X%=2:Y%=71:C%=0:D%=0
 270 s%=0:P%=2000:?&E3A=190:?&E3B=0:?&E
3C=0:*FX14
 280 SOUND3,0,0,0:ENDPROC
 290 DEFPROCprntsc:GCOL0,129:GCOL0,7
 300 VDU24,482;960;796;990;16,26,5
 310 MOVE482,988:PRINT"SCORE"
 320 COLOUR7:COLOUR129:VDU4,26
 330 PRINTTAB(6,2)SPC(8)TAB(6,3)"000000
00"TAB(14,5)"NAME"TAB(12,6)SPC(8)TAB(12,
7)$&380
 340 PRINTTAB(2,5)"HIGH"TAB(0,6)SPC(8)T
AB(0,7)LEFT$("00000000",8-LEN(STR$(hs%))
)+STR$(hs%)
 350 GCOL0,6:MOVE0,1023:MOVE0,966:PLOT8
5,480,1023:MOVE1279,1023:MOVE1279,966:PL
OT85,800,1023
 360 GCOL1,4:MOVE0,832:MOVE508,832:PLOT
85,254,900:MOVE772,832:MOVE1279,832:PLOT
85,1028,900:MOVE384,960:MOVE892,960:PLOT
85,640,1048
 370 ENDPROC
 380 DEFPROCdash:LOCALc%,x%,y%
 390 c%=9:y%=192:FORx%=330TO-6STEP-6
 400 IFx%>0SOUND&11,-15,x%DIV2,1:*FX19
 410 CALLQ%,c%,x%,y%:SOUND&11,0,0,1
 420 PROCdel(1):NEXT:ENDPROC
 430 DEFPROCend:VDU17,128,28;24,19,10,1
2,17,132,28,4,18,15,16,12
 440 PRINT" GAME  OVER":PROCfade
 450 COLOUR128:CLS:IFs%>hs%PROCgetname
 460 ENDPROC
 470 DEFPROCgetspc:VDU17,132,17,7,28,3,
15,16,11,12
 480 PRINTTAB(0,1)"PRESS SPACE TO"TAB(5
,3)"PLAY":*FX21
 490 LOCALc%,x%,y%,xa%,ya%:c%=10:x%=160
:y%=100:REPEAT:*FX19
 500 CALLQ%,c%,x%,y%:IFRND(10)=1xa%=(RN
D(3)-2)*4:ya%=(RND(3)-2)*2
 510 IFx%+xa%>280ORx%+xa%<20xa%=-xa%:SO
UND1,1,100,1
 520 IFy%+ya%>126ORy%+ya%<50ya%=-ya%:SO
UND1,1,100,1
 530 x%=x%+xa%:y%=y%+ya%:UNTILINKEY-99
 540 x%=148:y%=208:CALLQ%,c%,x%,y%
 550 COLOUR128:CLS:ENDPROC
 560 DEFPROCfade:FORT%=80TO0STEP-1:ENVE
LOPE4,2,0,0,0,0,0,0,T%,-1,-2,-2,T%,0:VDU
19,7,T%MOD8;0;:PROCdel(3):NEXT:*FX13
 570 *FX21,7
 580 VDU19,7,7;0;:ENVELOPE4,2,0,0,0,0,0
,0,80,-1,-2,-2,80,0:ENDPROC
 590 DEFPROCgetname
 600 ?&E3A=240:?&E3B=192:?&E3C=192
 610 *FX14
 620 SOUND3,0,0,0:hs%=s%:T%=0:$&380="
        ":PROCprntsc:COLOUR129:VDU28,4,18,
15,16,12:PRINT" ENTER NAME"CHR$26TAB(12
,7);:COLOUR12:VDU19,12,8;0;:*FX21
 630 REPEAT:I%=GET:IFI%>31ANDI%<127ANDT
%<8VDUI%:T%?&380=I%:T%=T%+1ELSEIFI%<>127
ANDI%<>13SOUND1,-15,100,5
 640 IFI%=127ANDT%VDUI%:T%=T%-1:T%?&380
=13-19*(T%<>8)
 650 UNTILI%=13:PROCprntsc:VDU28,4,18,1
5,16,12:PRINT" YOUR  TOPS"CHR$26:PROCfa
de
 660 ENDPROC
 670 DEFFNrart(m%)
 680 IFm%<>TRUE s%=s%+(S%+1)*1000:=m%
 690 X%=2:Y%=71:?&77=0:L%=L%-1:IFL%THEN
=0
 700 =m%
 710 DEFPROCinit:VDU23;8202;0;0;0;:Q%=&
900:E%=&84:hs%=100:?&77=0:?&220=0:?&221=
&11:$&380=" TIGGER ":*FX14,4
 720 *FX16
 730 *FX9,3
 740 *FX10,3
 750 ENDPROC
 760 DEFFNplay(a%,b%,c%,d%,e%,f%,g%,h%,
i%,F%,G%,H%):LOCALm%
 770 V%=(S%DIV9)*4:F%=F%+V%:G%=G%+V%:H%
=H%+V%:TIME=0:V%=320:U%=400:?&8D=0:REPEA
T:IFD%PROCfall
 780 IFTIME>P%V%=U%
 790 b%=b%-F%:IFb%<0 b%=V%:IFV%=U%F%=0
 800 e%=e%-G%:IFe%<0 e%=V%:IFV%=U%G%=0
 810 h%=h%-H%:IFh%<0 h%=V%:IFV%=U%H%=0
 820 CALLQ%,C%,X%,Y%
 830 CALLQ%,a%,b%,c%:IF?E%D%=TRUE
 840 CALLQ%,d%,e%,f%:IF?E%D%=TRUE
 850 CALLQ%,g%,h%,i%:IF?E%D%=TRUE
 860 IFZ%IFRND(20)=1SOUND&11,3,170,5
 870 IFO%PROCs
 880 IFW%c%=FNh
 890 IFb%=U%IFe%=U%IFh%=U%IFm%<>TRUE m%
=1
 900 UNTILm%
 910 =FNrart(m%)
 920 DEFPROCfall
 930 LOCALc%,x%,y%,j%,k%
 940 s%=s%+?&8D*(S%+1)*10:VDU26
 950 X%=X%*4+6:x%=X%:j%=80:c%=12:y%=36
 960 CALLQ%,C%,j%,Y%:CALLQ%,c%,x%,y%
 970 SOUND0,2,6,10:VDU26:COLOUR7:COLOUR
129:PRINTTAB(6,3)LEFT$("00000000",8-LENS
TR$(s%));s%CHR$30
 980 c%=11:y%=Y%:B%=-6:j%=26:k%=6:REPEA
T:CALLQ%,c%,x%,y%:PROCdel(1):x%=x%+2:y%=
y%+B%
 990 IFy%>j%+55B%=-k%:j%=j%-1:IFj%<1j%=
1
1000 IFy%<=55:y%=55:B%=k%:SOUND&11,1,50
,1
1010 UNTILx%>300
1020 b%=TRUE:e%=TRUE:h%=TRUE:?&77=0:D%=
0:m%=TRUE:c%=10:x%=148:y%=208:C%=12:Y%=3
6:REPEAT
1030 IFx%<>X%+16x%=x%+SGN((X%+16)-x%)*2
1040 IFy%<>52 y%=y%-6
1050 *FX19
1060 CALLQ%,c%,x%,y%:*FX19
1070 SOUND&10,-15,3,1:SOUND&11,0,y%+30,
1:UNTILx%>X%+13ANDx%<X%+19ANDy%=52:REPEA
T:x%=x%+6:X%=X%+6:*FX19
1080 CALLQ%,c%,x%,y%:CALLQ%,C%,X%,Y%
1090 SOUND&10,-15,7,1:SOUND&11,0,x%DIV2
,1:UNTILx%>320:IFL%-1x%=148:y%=208:CALLQ
%,c%,x%,y%
1100 X%=80:Y%=71:C%=0
1110 ENDPROC
1120 DEFFNscr0:VDU19,13,0;0;:LOCALA%:?&
8C=192:Z%=0:O%=0:W%=0:REPEAT:A%=FNplay(2
,320,25,4,480,256,3,480,25,8,8,8):UNTILA
%:=A%
1130 DEFFNscr1:LOCALA%:Z%=TRUE:?&1283=2
:?&1284=2:REPEAT:A%=FNplay(2,320,25,1,34
0,85,3,480,25,8,2,8):UNTILA%:VDU19,13,15
;0;:=A%
1140 DEFFNscr2:LOCALA%:?&8C=255:Z%=0:RE
PEAT:A%=FNplay(4,320,35,5,480,35,6,540,2
56,7,7,7):UNTILA%:=A%
1150 DEFFNscr3:LOCALA%:?&8C=243:?&1283=
2:?&1284=0:O%=4:VDU19,12,4;0;:PROCtunn(1
30):REPEAT:A%=FNplay(7,320,126,8,480,126
,5,320,256,9,9,9):UNTILA%:=A%
1160 DEFFNscr4:LOCALA%:O%=2:REPEAT:A%=F
Nplay(7,320,126,8,536,126,5,428,35,9,9,9
):UNTILA%:IFNOTA%PROCtunn(128)
1170 O%=0:VDU19,12,8;0;:=A%
```

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MicroLink

```
1180 DEFFNscr5:LOCALA%:?&8C=255:Z%=0:RE
PEAT:A%=FNplay(4,320,35,5,428,35,6,536,3
5,7,7,7):UNTILA%:=A%
1190 DEFFNscr6:LOCALA%:?&8C=243:?&1283=
2:?&1284=0:O%=4:VDU19,12,4;0;:PROCtunn(1
30):REPEAT:A%=FNplay(7,320,126,8,430,126
,9,320,35,9,9,12):UNTILA%:IFNOTA%PROCtun
n(128)
1200 O%=0:VDU19,12,8;0;:=A%
1210 DEFFNscr7:LOCALA%:REPEAT:A%=FNplay
(9,320,35,3,540,256,4,540,256,18,18,18):
UNTILA%:=A%
1220 DEFFNscr8:y%=-6:W%=TRUE:LOCALA%:RE
PEAT:A%=FNplay(10,310,96,5,420,35,4,580,
35,4,8,8):UNTILA%:=A%
1230 DEFFNh
1240 c%=c%+y%:IFc%>150ORc%<68y%=-y%
1250 SOUND&111,0,c%,2:SOUND&110,-15,7,2
:=c%
1260 DEFPROCs
1270 IFc%<126c%=c%+2ELSEIFRND(O%)=1:c%=
100:SOUND&10,-10,4,4
1280 IFf%<126f%=f%+2ELSEIFRND(O%)=1:f%=
100:SOUND&10,-10,4,4
1290 ENDPROC
1300 DEFPROCtunn(c%):COLOURc%
1310 FORT%=18TO0STEPTRUE:VDU28,T%,18,T%
+1,10,12:CALLQ%,C%,X%,Y%:PROCdel(2):NEXT
1320 ENDPROC
1330 DEFPROCdel(w%):w%=w%+TIME:REPEATUN
```

```
TILTIME>w%:ENDPROC
 1340 THEEND
 1350 DEFPROCcode
 1360 VDU23,144,12,12,14,30,248,240,96,9
6:ENVELOPE1,3,6,10,10,4,4,4,127,0,0,-10,
126,0:ENVELOPE2,2,0,0,0,0,0,0,126,-1,-3,
-3,126,0:ENVELOPE3,3,-3,-3,-3,3,3,3,126,
0,0,-6,126,0:ENVELOPE4,2,0,0,0,0,0,0,80,
-1,-2,-2,80,0
 1370 w=&70:jf=&77:j=&78:sno=&80:xc=&81:
yc=&82:wp=&83:hit=&84:ht=&85:tot=&86:xs=
&87:ys=&88:tl=&89:ht2=&8B:m=&8C:njs=&8D
 1380 FORT%=&900TO&AFFSTEP4:!T%=0:NEXT
 1390 FORT%=&E00TO&12FFSTEP4:!T%=0:NEXT
 1400 FORT=0TO2STEP2:P%=&900:[OPTT:.Q%
 1410 LDX#5:LDY#8:.lp1
 1420 LDA&600,Y:STAw,X:DEX:DEY
 1430 LDA&600,Y:STAw,X:DEY:DEY
 1440 DEX:BPLlp1:LDY#0:STYwp:LDA(w),Y
 1450 STAsno:TAX:LDAsptht,X:STAht
 1460 LDAspttot,X:STAtot:LDA(w+2),Y
 1470 STAxc:INY:LDA(w+2),Y:STAyc:TXA
 1480 BEQoth:LSRyc:RORxc:LSRyc:RORxc
 1490 .oth:DEY:LDAxc:CMPmx,X:BCCgety
 1500 DECwp:.gety:LDA(w+4),Y:STAyc:INY
 1510 LDA(w+4),Y:BEQntoff:DECwp:.ntoff
 1520 LDAwp:BEQo:LDA#&90:STAw+1:BMIntp
 1530 .o:LDA#0:STAw+1:LDAxc:ASLA
 1540 ROLw+1:ASLA:ROLw+1:ASLA:ROLw+1
 1550 STAw:LDAyc:AND#7:EOR#7:CLC:ADCw
 1560 STAw:BCCypoint:INCw+1:.ypoint
 1570 LDAyc:AND#248:LSRA:LSRA:TAX:CLC
 1580 LDArp,X:ADCw:STAw:INX
 1590 LDArp,X:ADCw+1:STAw+1:.ntp
 1600 LDAsno:BEQisd:JMPntd:.isd
 1610 LDY#0:LDX#&9E:JSRi:BNEright
 1620 DECxc:DECxc:.right:LDX#&BD:JSRi
 1630 BNElimits:INCxc:INCxc:.limits
 1640 LDAxc:CMP#5:BCSnl:INCxc:INCxc
 1650 .nl:CMP#50:BCCnthi:DECxc:DECxc
 1660 .nthi:LDY#0:LDAxc:STA(w+2),Y
 1670 LDAjf:BMIprd:BNEjing:LDX#&B6
 1680 JSRi:BNEprd:JSRboing:LDA#4:STAj
 1690 .jing:LDY#0:CLC:LDAyc:ADCj
 1700 STA(w+4),Y:CLC:LDAjf:ADC#1:STAjf
 1710 CMP#5:BNEgup:LDA#&FC:STAj:.gup
 1720 CMP#10:BNEprd:LDA#0:STAjf:.prd
 1730 LDAw:STAw+5:LDAw+1:STAw+6:JSRfx
 1740 LDX#0:JSRd:CLC:LDAw+5:STAw:LDAw+6
 1750 ADC#5:STAw+1:JSRfx:LDX#2:JSRd
 1760 CLC:LDAw+5:STAw:LDAw+6:ADC#&A
 1770 STAw+1:JSRfx:LDX#4:JMPd:.ntd
 1780 INCsno:INCsno:ASLsno:LDXsno:.d
 1790 LDAsdp,X:STAcl+1:LDAol,X:STAtl
 1800 LDAw:STAol,X:STXxs:INX:LDAol,X
 1810 PHA:LDAsdp,X:STAcl+2:LDAw+1
 1820 STAol,X:PLA:STAw+1:LDAntst:STAg
 1830 LDAntst+1:STAg+1:JSRpr:LDA#0
 1840 STAhit:LDXxs:LDAol,X:STAtl:INX
 1850 LDAol,X:STAw+1:BMIbyby:LDAtst
 1860 STAg:LDAtst+1:STAg+1:.pr
 1870 LDAtl:AND#248:STAw:LDAtl:AND#7
 1880 STAys:LDXtot:SEI:.plp1
 1890 LDAht:STAht2:LDAw:STAw+2:LDAw+1
 1900 STAw+3:LDYys:.plp2:LDA(w+2),Y
 1910 .g:BNEb:.cl:EOR&9000,X
 1920 STA(w+2),Y:DEX:BEQbyby:DECht2
 1930 BEQnr:INY:CPY#8:BNEplp2
 1940 CLC:LDAw+2:ADC#&80:STAw+2:LDAw+3
 1950 ADC#2:STAw+3:LDY#0:JMPplp2
 1960 .nr:CLC:LDAw:ADC#8:STAw:BCCplp1
 1970 INCw+1:JMPplp1:.byby:CLI:LDAhit
 1980 ANDm:STAhit:RTS:.tst:NOP:NOP
 1990 .ntst:NOP:NOP:.b:PHA:ORAhit
 2000 STAhit:PLA:JMPcl:.i:LDY#&FF
 2010 LDA#&81:JSR&FFF4:INX:RTS:.mark1
 2020 ]:P%=&E00:[OPTT:.tune:CPX#7:BEQv
 2030 PLP:RTS:.v:PHA:TXA:PHA:TYA:PHA
 2040 LDXtcnt:LDAtdta,X:STAtblk+4
 2050 BEQr:LDA#4:.r:STAtblk+2:INX
 2060 LDAtdta,X:STAtblk+6:INX:CPXtflg
 2070 BNEntyet:LDXtstt:.ntyet:STXtcnt
 2080 LDX#tblk MOD256:LDY#tblk DIV256
 2090 LDA#7:JSR&FFF1:JMPout:.tflg
 2100 BRK:.tcnt:BRK:.tstt:BRK:.tblk
 2110 OPT FNskip(8):.tdta
 2120 ]:P%=&1100:[OPTT:.ev:PHP:CMP#4
 2130 BEQf:JMPtune:.f:PHA:TXA:PHA:TYA
 2140 PHA:DECc1:BNEnextcol
 2150 LDAt1:STAc1:LDA#8:STAch
 2160 LDAcol1:STAch+1:JSRc
 2170 LDA#9:STAch:LDAcol1:EOR#2
 2180 STAch+1:STAcol1:JSRc
 2190 LDAjog:EOR#255:STAjog:BEQnextcol
 2200 LDA#10:STAch:LDAcol2:STAch+1
 2210 JSRc:LDA#11:STAch:LDAcol2:EOR#5
 2220 STAch+1:STAcol2:JSRc:.nextcol
 2230 DECc2:BNEout:LDAt2:STAc2:LDAacl1
 2240 STAch:LDAcol3:STAch+1:JSRc
 2250 LDAacl2:STAch:LDAcol3:EORecl3
 2260 STAch+1:STAcol3:JSRc:.out
 2270 PLA:TAY:PLA:TAX:PLA:PLP:RTS:.c
 2280 LDA#&C:.s:LDX#ch MOD256
 2290 LDY#ch DIV256:JMP&FFF1
 2300 .fx:LDA#19:JMP&FFF4:.boing
 2310 INCnjs:LDA#2:STAch:LDA#1:STAch+2
 2320 STAch+4:STAch+6:LDA#0:STAch+1
 2330 LDA#7:JMPs:.mx:OPT FNskip(16)
 2340  .ol:OPT FNskip(32)
 2350 .sptht:OPT FNskip(16)
 2360 .spttot:OPT FNskip(16)
 2370 .sdp:OPT FNskip(32)
 2380 .rp:OPT FNskip(65)
 2390 .ch:OPT FNskip(8)
 2400 .c1:BRK:.c2:BRK:.t1:BRK:.t2:BRK
 2410 .col1:BRK:.col2:BRK:.col3:BRK
 2420 .ecl3:BRK:.acl1:BRK:.acl2:BRK
 2430 .jog:]:NEXT
 2440 ?tflg=190:!tblk=3:tblk!4=0:?c1=15:
?t1=15:?col1=2:?col2=5:?c2=40:?t2=40:?co
l3=2:?acl1=14:?acl2=15:?ecl3=2:G%=col3:H
%=ecl3:?tst=?g:tst?1=g?1:E$="THERE IS A
DATA ERROR"
 2450 IFFNeval(tdta)<>&AF2F22EB:CLS:PRIN
TTAB(0,10)E$" BEFORE LINE 2760":END
 2460 N%=ol:FORT%=0TO14:!N%=&9000:N%=N%+
2:NEXT
 2470 PROCread(mx,12,1)
 2480 PROCread(sptht,12,1)
 2490 PROCread(spttot,12,1)
 2500 PROCread(sdp,28,2)
 2510 PROCcheck(mx,ch,&1CC5,4)
 2520 N%=rp:FORT%=31TO0STEP-1:!N%=&3000+
640*T%:N%=N%+2:NEXT
 2530 PROCcheck(&900,&AFF,&EA06,1)
 2540 PROCcheck(&E00,tflg,&1746,2)
 2550 PROCcheck(ev,mx,&4B74,3)
 2560 IFFNeval(&1300)<>&59083FB CLS:PRIN
TTAB(0,10)E$" AFTER LINE 2760":END
 2570 ENDPROC
 2580 DEFFNeval(N%):C%=0:REPEAT:READA$
 2590 !N%=EVAL("&"+A$):C%=C%+!N%:N%=N%+4
 2600 UNTILA$="12345678":=C%
 2610 DEFPROCread(P%,N%,S%):FORT%=0TON%S
TEPS%
 2620 IFN%<15READT%?P%ELSEREADT%!P%
 2630 NEXT:ENDPROC
 2640 DEFFNskip(S%):P%=P%+S%:=T
 2650 DEFPROCcheck(s%,f%,c%,i%)
 2660 LOCALC%,T%:FORT%=s%TOf%:C%=C%+?T%:
NEXT:IFC%=c%ENDPROC
 2670 CLS:PRINTTAB(0,10)"THERE IS AN ERR
OR IN":IFi<4PRINT"ASSEMBLER ":ELSEPRINT"
SPRITE POINTER DATA":END
 2680 ONi%GOTO2690,2700,2710
 2690 PRINT"BEFORE .mark1":END
 2700 PRINT"AFTER .mark1""AND BEFORE .t
flg":END
 2710 PRINT"AFTER .ev""AND BEFORE .mx"
 2720 END
 2730 DATA281027D,4890489,489047D,489049
1,400047D,C75047D,875047D,281027D,489048
9,489047D,4890491,400047D,275027D,275026
D,475047D,400086D,4890489,47D0489,289028
9,4890491,400047D
 2740 DATAC75047D,875047D,4890489,47D048
9,2890289,2910291,2890289,400047D,275027
D,275026D,475047D,4000C6D,26D066D,489047
D,4000C9D,2910691,491049D,27D0C89,489028
1,27D0489
 2750 DATA289027D,4910289,87D0489,27D047
5,47D0281,2750275,4810C6D,26D0665,27D067
5,6950881,8890281,2890695,6950881,665028
1,675026D,881027D,29D0695,69D08A5,C95029
5,85FCA9FF,12345678
 2760 DATA68,72,74,74,76,76,76,75,75,74,
74,74,65,16,12,8,8,12,12,12,32,32,12,16,
32,12,208,84,48,48,48,48,48,160,160,84,9
6,192,180,&12FF,&13CF,&149F,&156F,&15C3,
&15C3,&15F3,&15F3,&15F3,&1623,&1623,&16C
3,&1717,&1777,&1837
 2770 DATA80C,0,0,0,80C0C0C,0,0,0,C3F2A0
C,0,0,0,4040C0C,0,3C3C3C00,20000,28,3C00
3C00,2A3F3C28,303163C,36362828,283C3C36,
3C163C3C,1030316,11119B,3030200,3030303,
10101,0,10100,0,0,0,0,0,0,0,0,0,0,0,0,
0,0
 2780 DATA0,0,0,0,0,0,0,0,8200,82000000,
C00C008,80400000,80A00C3,4100080A,80480C
,40000D0E,8084904,D0E0D0E,80C0C08,D0E0D0
E,808080C,C0C0C,C040428,C040504,4040C0C,
4,2800283C,22283C14,36362222
 2790 DATA363636,283C3C14,363C3C3C,33333
333,33333333,9B333333,33999914,9B333333,
11119B,0,0,0,0,0,80C0,0,0,0,804000,0,0,0
,0,0,0,0,0,0,0,0
 2800 DATA0,0,0,0,0,0,0,0,82008249,80808
08,82,D0A080A,8484C184,C0C0404,5080C0C,D
0E0504,8084082,C40000C,3C000C0C,500143C,
441C300,C0A0D0A,14080C0C,3C3C3C3C,D0A000
0
 2810 DATAC0C0D0C,C0C0C0C,828208,C0C0D0A
,C0C0C0C,4040404,0,C0C0D04,C0C,0,0,C0400
00,80480C0C,80808000,C0C0C0C0,41000000,C
0C8604,4040480C,40,0,41000000,C3C34141,8
282,0,0,0,82C34141
 2820 DATA0,26330000,8,0,19190000,223319
,A8000000,C0C5CFC,3300AC,FCFCA800,5D5DAE
FC,FF0C,54FCFC,ACAC5C00,FFFFFF,220000FC,
C0C11,FFFF0000,11000000,C00,55000000
 2830 DATAA000000,F3F32A0A,30250A00,F3F3
3F30,3030250A,F3F33F30,30303010,F3F33F30
,30301000,F3F33F30,10000000,F3F33F10,0,3
172311,202,13220202,32B3302,2030317,2311
0101,32B3301,117032B,0,32B1322,101
 2840 DATA22111105,002A0022,0,0,0,0,0,0,
33050000,0022333B,0,0,0,0,0,0,33110500,5
```

Turn to Page 148 ▶

◀ *From Page 147*

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033333B,50505050,50505050,50505050,50505
050,50505050,50505050,33050000,002A1133,
0,0,0,0,0,0,00111105,0,0,0,0,0,0,0
 2850 DATABF2F1F1,2213,0,FF2F1F1,2213030
3,0,FF2F1F1,3030303,2213,F5AF1F1,1030303
,22222201,30707F1,33220003,11333333,2000
300,33331113,41933,2B000100,1012B,40000
 2860 DATA80C0404,808,A4080000,8A6A6A4,C
080000,80C0C2E,AA0C000C,CA8A8AA,1D2E0C00
,C080C0C,400080C,40404,2E1D0C00
 2870 DATAC040C0C,800040C,80808,C040000,
40C0C1D,500C000C,C515150,40C0808,404,5D0
40000,45C5C5D
 2880 DATA3C3C2800,141414,0,0,0,0,0,0,3C
3C3C,0,0,0,0,0,28282800,0,223C3C3C,33333
333,22222222,0,0,28002800,3E143C28,20328
28,3C3C3C14,33333339,33333333
 2890 DATA39393939,36362839,3C283C36,3D3
D3C3C,303033C,333C1400,39393333,36363636
,33333333,111133,16160200,16031616,30303
,0,11111100,11111111,11,0,1030300,101010
.,0
 2900 DATAC0C0808,C2E040C,8A880008,40008
08,C1D1D04,CECD000C,C0E0400,C0C0C0E,0,80
8080C,C0C0508,80C,80A0800,C0E0C04,80C0C,
D0E0D0A,C0E0D0E,C0C0C,D0E0D0E,404050E,C0
C0C0C,5040504
 2910 DATAC0C0C08,C0C0408,C0E0C0C,C0E0C0
E,40C0C,8000004,C0C0D0E,C,D0E0000,40C0D0
E,0,D0E0D00,40C0C,0,C0C8480,8286,0,41C0C
0C0,C3C3,0,C04000,C34100,0,12345678
 2920 DEFPROCshorten:VDU23;8202;0;0;0;
 2930 CLS:FORT%=0TO1:PRINTTAB(7,T%)CHR$1
29CHR$157CHR$141CHR$134TAB(11)"DINO"TAB(
25)CHR$156:NEXT:*FX21
 2940 PRINTTAB(7,2)CHR$129CHR$157CHR$130
"and the saurus races  "CHR$156
 2950 PRINTTAB(12,4)"By Gordon J. Key"
 2960 IFPAGE<>&1900 PROCrelocate
 2970 PRINTTAB(0,8)CHR$134" The adventur
es of an Ancient Britain"
 2980 PRINTCHR$134" as he tries to ride
his goblosaurus"
 2990 PRINTTAB(8,12)CHR$130"Use the foll
owing keys"
 3000 PRINTTAB(12,14)"Z.........LEFT"
 3010 PRINTTAB(12,16)"X.........RIGHT"
 3020 PRINTTAB(12,18)"RETURN....JUMP"
 3030 PRINTTAB(4,22)CHR$131"Please wait
for a short while"
 3040 PROCcode:T%=PAGE+1:A$=STRING$(255,
"*"):REPEAT:T%=T%+LEN$T%+1
 3050 IF?T%=255CLS:PRINTTAB(0,10)"LINE 2
820 IS MISSING OR INCORRECT"CHR$7:END
 3060 A$=$(T%+3):REPEAT:IFLEFT$(A$,1)="
"A$=RIGHT$(A$,LEN(A$)-1)
 3070 UNTILLEFT$(A$,1)<>" "
 3080 UNTILLEFT$(A$,6)="THEEND"
 3090 SOUND1,1,200,10:REPEAT
 3100 PRINTTAB(4,22)CHR$(RND(7)+128)"PRE
SS SPACE WHEN YOU ARE READY"
 3110 UNTILINKEY-99:SOUND1,1,120,10
 3120 ?T%=&FF:*FX3,2
 3130 *KEY0OLD|MRUN|M
 3140 *FX138,0,128
 3150 END
 3160 DEFPROCrelocate:*FX138,0,128
 3170 PRINTTAB(0,10)"PLEASE WAIT WHILST
I RELOCATE TO &1900"':*FX3,2
 3180 IFPAGE<&1900:*KEY0FORT%=TOP-PAGE T
O-4STEP-4:T%!&1900=T%!PAGE:N.:PAGE=&1900
|MOLD|MRUN|M
 3190 IFPAGE>&1900:*KEY0FORT%=0TOTOP-PAG
E STEP4:T%!&1900=T%!PAGE:N.|MPAGE=&1900|
MOLD|MRUN|M
```

This listing is included in this month's cassette tape offer. See order form on Page 159.

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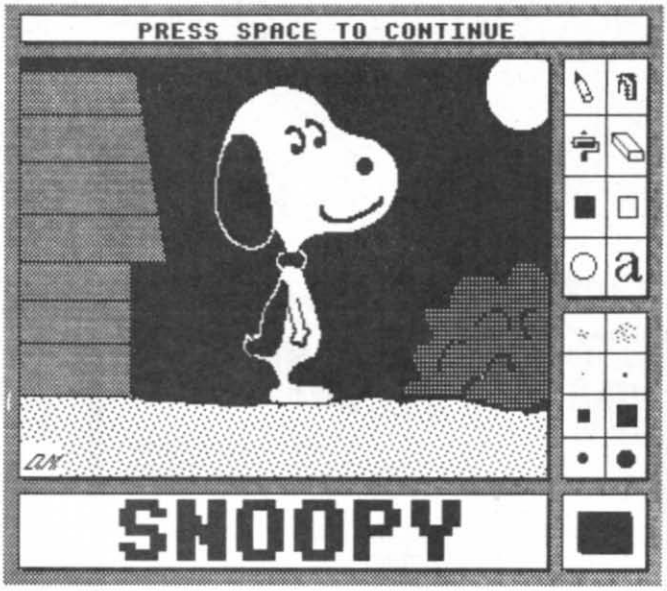
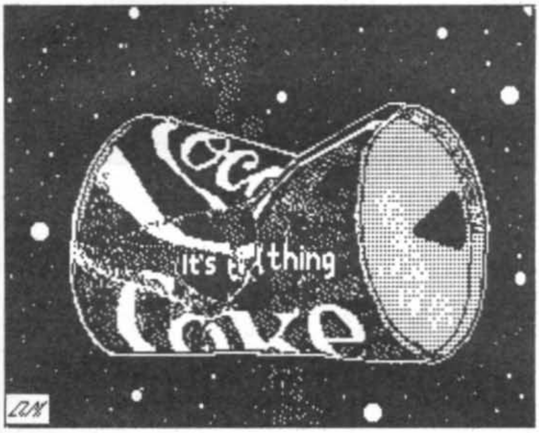
GALLERY

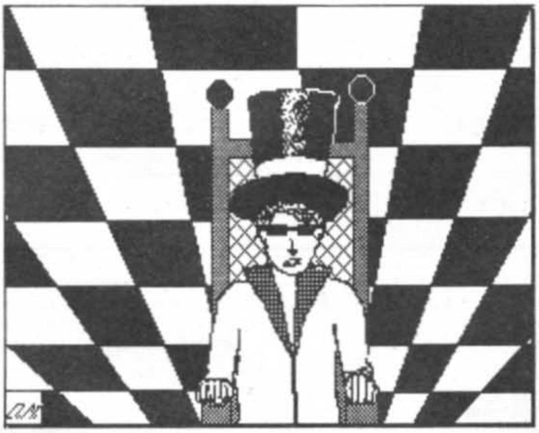
ONE of our regular readers, Peter Clifton, was so thrilled with his latest acquisition, the AMX Mouse, that he sent us a disc full of his newest creations.

We are delighted to display his talents here. Why don't you send us your works of art? You never know, this could be the start of something good.

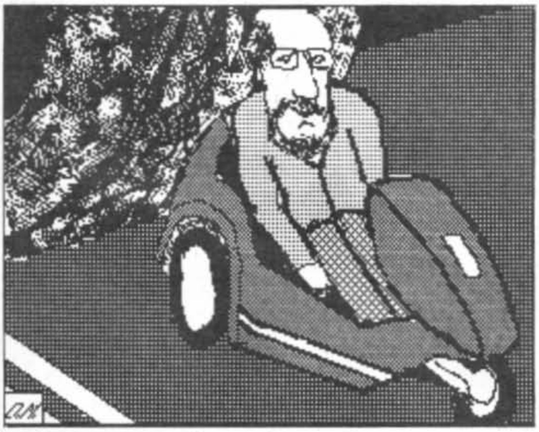

PRESS SPACE TO CONTINUE
a
SNOOPY


Coca
It's thing
Coke

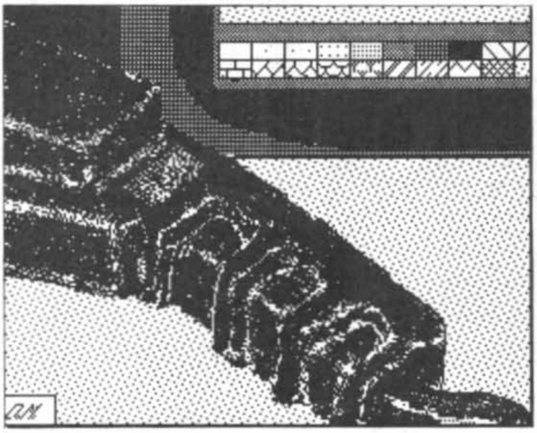
The real thing



Hatter



Hedgehog 1985 AD



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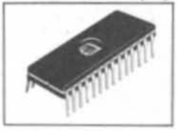

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LETTERS

£10 Prize letter

Tip requires a spot of polish

I HAVE a useful tip for users of Mini Ofice II, but would like to ask advice on tidying it up.

When you are using the spreadsheet to prepare, for instance, quarterly reports, it would be very useful to read in from disc a column or row of figures representing the same period of the previous year.

Ideally of course, this column should be saved directly from the previous spreadsheet.

The first step is relatively simple:

Prepare an Ascii file of the data, starting with a dummy figure or simply Return and separating the data by Return only.

Position the cursor in the current spreadsheet at the first cell to be filled. Use f9 to give automatic cursor movement in the required direction.

*Return to the spreadsheet menu and *EXEC (filename). The result is a rather noisy but fast input of data.*

Getting the data out of the spreadsheet is not so tidy. Luckily the graphic output from the menu creates an Ascii file, but it insists on saving two columns.

It also tags on some header data and throws in an extra Return. It is possible to use such a file in the manner described, but good planning is required and at least two cells have to be wasted to dispose of garbage.

A neater but more time consuming way is to use the word processor to edit the file to the correct form.

Can anyone come up with a better way of generating this file please? – **K.Dronsfield, Preston, Lancs.**

Wrong number

IN YOUR review of Codas in the December 1986 issue of The Micro User *my telephone number was misquoted. The correct number for enquiries regarding Codas is 061-485 5435.*

May I apologise for any inconvenience caused to the lady at the number quoted, and thank her for redirecting calls to the correct number. – **Jack Golten, Cheadle Hulme, Cheshire.**

Pointless adventures

I AM amazed at the number of solutions to adventure games appearing in various magazines.

It has been my belief that enjoyment comes from solving the clues in the games. If you want to annoy a crossword addict stand next to him and call out the answers.

The adventure fiend not only undermines all the effort involved in solving our favourite adventure games, but actually wins money for doing so.

At least magazines should carry a warning that such disclosures appear on certain pages.

If the route through an adventure game is known, then what is the point of playing it? – **Graham Conridge, Leyton, London.**

● There are several points of view as to whether we should publish games hints. What do other adventurers think?

Win a tenner

● **Want to write to Micromail? The address is: Letters The Micro User, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.**

Writers of the most interesting letters receive a £10 prize.

Random numbers

I READ, with great interest, Simon Bartrham's letter in the January 1986 issue of The Micro User *concerning the generation of random numbers from machine code programs.*

His solution was certainly ingenious but, as in so many other cases where assembly language programmers require the results of functions available to Basic, I find that the best method is to use those subroutines kindly provided by Acorn in the Basic rom.

Some people might regard this as cheating but I would like to point out the following advantages.

Code length can usually be dramatically reduced and the time-consuming efforts of coding your own solutions can be avoided thereby allowing a greater degree of worthwhile programming activity.

Program execution speeds can usually be increased greatly and the formulation of structured programs is greatly eased.

In order to understand how random numbers can be generated from within machine code programs it is first necessary to be aware of how the RND function of Basic is supported.

All random numbers, integers and floating point numbers have their own work areas within the memory map. These are as follows:

Random number work area (ROA) – &0D-&11 (low byte first)

Integer work area (IOA) – &2A-&2D (low byte first)

Floating point work area A (FOA) – &2E-&35

Floating point work area B

Turn to Page 154 ▶

ADDRESSES ON DISC

I AM finding it increasingly difficult to find shops dealing in software these days and have been looking for some weeks for an address book on disc, as it were.

I use a BBC B Micro purely as a word processor – the computing side is a closed shop to me I am afraid – and it struck me that it would be very useful to be able to store addresses on disc.

I would like to be able to store them in various categories, such as the Christmas list, or television companies (I am a writer) and be able to print only those categories that I require at any given time.

Two shops have offered to make a program for me at what seem to be pretty expensive rates, but surely there is a disc available somewhere that answers my comparatively simple needs.

I do not require the full business package offered by some people, purely an address book on disc. I wonder whether you can help me and tell me if such a thing exists and who might be able to supply it? – **Michael McStay, Brockenhurst, Hants.**

● Mini Office II combines word processing and a database which can be set up as a card index file – just as you wish.

See also the Mailmerge article in the October 1986 issue of *The Micro User.*

LETTERS

◀ **From Page 153**

(FOB) – &3B-&42

Floating point numbers are stored in the standard format (low byte first) of sign, overflow, exponent, mantissa-1, mantissa-2, mantissa-3, mantissa-4, rounding byte.

When generating random numbers the BBC Micro applies a pseudo-randomising algorithm to a seed value with the resultant number being returned to the user and becoming the new seed value.

As the same seed value is implanted on each power-up, the algorithm can only pseudorandom. This can be overcome from Basic by using RND(-TIME).

All of the RND functions available to users of Basic can be utilised by assembly language programmers at the locations listed in Table I.

In using these subroutines there are certain entry conditions that must be met and certain events take place in their use.

Probably the most important of these features is that all registers, including the status register, should be pushed on to the stack prior to using the subroutine as their contents are destroyed.

And the non-exclusive nature of all the work areas mentioned earlier means that results obtained from the subroutines should be accessed immediately after completion.

The conditions that are required are clearly shown in Table II.

Using these subroutines will be of great benefit to those assembly language users who wish to save themselves many long hours of heartache spent coding already existing routines. – **Adrian Jakeman, Arnold, Nottingham.**

● This is an excellent idea – but be careful if you use them from rom-based software since jumping into a different rom is tricky and Basic may not be present.

Do any of our readers know of the corresponding entry points for Basic 4?

Function	Basic 1	Basic 2	Execution Time (μsec)
RND	&AF80	&AF51	745
RND(-X)	&AF6E	&AF3F	42
RND(0)	&AF9B	&AF6C	82
RND(1)	&AF98	&AF69	793
RND(X)	&AF53	&AF24	2974

Table I: Rom entry addresses

RND	On entry	none
	On exit	IOA = result ROA = re-seeded FOA = unchanged FOB = unchanged
RND(-X)	On entry	IOA = value to be seeded (positive/negative)
	On exit	IOA = unchanged ROA = IOA (&11 contains #&40 FOA = destroyed FOB = unchanged
RND(0)	On entry	none
	On exit	IOA = destroyed ROA = unchanged FOA = result FOB = unchanged
RND(1)	On entry	none
	On exit	IOA = destroyed ROA = re-seeded FOA = unchanged FOB = unchanged
RND(X)	On entry	&4,&5 point to HIMEM (low byte first) IOA = maximum value of random number
	On exit	IOA = result ROA = re-seeded FOA = destroyed FOB = unchanged

Table II: Entry and exit conditions

£10 Prize letter

Automatic copying

THE question about copying an 80 track disc on to one or more 40 track discs in the January 1987 issue of The Micro User *stimulated me to write the accompanying short program to do the job automatically.*

It makes use of the Disc full error – ERR=198 – to allow prompting for insertion of a fresh 40 track disc.

It first makes sure that it is running below the memory used for copying, then prompts for a source disc. Sector 0, track 0, containing catalogue information, is then read to a buffer by PROCread, using Osword &7F.

The directory and filename are read from the buffer by FNfn and when a file whose directory has an Ascii value of less than 32 is found this is taken to mean that the previously copied file was the last.

*Oscli is then used to *COPY the named file from drive 0 to drive 1; the pointer to the next filename in the buffer is incremented and a check is made that all the files have not been copied before going round the loop again.*

I was forced to use a GOTO loop because Basic forgets where it is in a FOR . . . NEXT or REPEAT . . . UNTIL loop when it hits an error. This is the price to pay for using an error to do your work for you.

– **Dr.M.B.Goatly, Wimbledon, London.**

```
  100 REM 80 to 40 Copier
  110 REM by Bruce Goatly
  120 REM (c) Micro User
  130 IFPAGE>&1200THENPAGE
=&1200:CHAIN"8040"
  140 MODE 7:HIMEM=&1800:B
%=&C00
  150 F%=&D00:O%=&B00:C%=&
80
  160 PRINT"Insert 80T dis
k in drive 0""Switch to 8
0T"
  170 PROCs:PROCread
  180 N%=0:ON ERROR VDU7:G
OTO 380
  190 PRINT'"Insert";:IFN%
PRINT" new";
  200 PRINT" 40T disk in d
rive 1"
  210 IFNOTN%PRINT"Switch
to 40T"
  220 PROCs
  230 f$=FNfn:IF D%<32 END
  240 $O%="COPY 0 1 "+f$
  250 X%=O%:Y%=O%DIV256:CA
LL&FFF7
  260 Z%=Z%+8:IFZ%=F% END
ELSE230
  270 DEFPROCread:?C%=0
  280 C%!1=B%:C%?5=3:C%?6=
&53
  290 C%?7=0:C%?8=0:C%?9=&
21
  300 X%=C%:Y%=0:A%=&7F:CA
LL&FFF1
  310 IFC%?10=0 Z%=B%+8:EN
DPROC
  320 PRINT"Catalog error.
":END
  330 DEFFNfn:D%=Z%?7AND&7
F:n$=""
  340 FOR T%=0TO6:n$=n$+CH
R$Z%?T%
  350 NEXT:=CHR$D%+"."+n$
  360 DEFPROCs:PRINT"press
 space"
  370 REPEATUNTILGET=32:EN
DPROC
  380 N%=-1:IF ERR=198 GOT
O190
  390 REPORT:PRINT" at ";E
RL
```

LETTERS

ALL programs printed in this magazine are exact reproduction of listings taken from running programs which have been thoroughly tested.

However, on the rare occasions when mistakes occur corrections are published as a matter of urgency. Should you encounter error messages when you type in a program, they will almost certainly be the result of your own typing mistakes.

Unfortunately we can no longer answer personal programming queries concerning these mistakes. Of course letters about suggested errors will be investigated without delay, but any replies found necessary will only appear in the mail pages.

Professional adventurer

I WOULD like to be able to write professional text-only adventure games on my Master 128 and I realise that Basic is not the best language for this.

So please could you tell me which is the best language to use? I would like it to be on rom and use the extra memory on the Master. – **Mark Sarul, Barwell, Leics.**

● There are several possibilities such as The Graphic Adventure Creator by Incentive and The Quill by Gilsoft.

Or there's How to Write Adventure Games, a book by Peter Killworth. And Adventure Description Language a book and program published by Sigma Press.

The first two are utilities to help write adventures and Peter Killworth gives his methods and hints on writing adventures in the book.

Only ADL is an actual language for writing adventures, but none of these is a rom or runs specifically on the Master.

Foolproof editing

I WOULD like to take Chris Nixon to task over his article Work to Rule in the November edition of The Micro User.

In this he states that "... cursor editing is disabled ..." which I have found to be invalid. I have version 2.1 of View in a BBC B and the program was typed in exactly as given in the article.

Cursor editing is not disabled when in the command mode of View. It would appear that every time one changes from text mode to command mode in View, cursor editing is enabled.

It is reasonable to expect View to enable cursor editing when in command mode and to disable it when in text mode, though not knowing the code within the rom I cannot confirm this.

*Obviously this can be overcome by using *FX4,2 but this defeats the point of the code. It also means that one has to remember that the cursor keys should not be used.*

This is an extremely useful piece of code, but it does need to be foolproof. Does he have a solution to this problem? – **Dr.T.J.Waterfiled, Norton, Daventry, Northampton.**

● Yes, you have caught me out. As you point out, View reenables cursor editing on each entry into command mode.

To prevent this, add the following lines to the program:

```
  270 JSR&FFF4:CPX#ASC"=":
BNEskip1
  272 LDA #4:LDX #2:LDY #0
:JSR&FFF4
  274 JMP restore:.skip1
```

and change line 190 to:

```
190 RTS
```

Also, I made no effort to take into account devices which redivert the osrdch vector lower than &8000 such as some shadow ram boards.

However, to accommodate such devices change line 140 to:

```
140 LDA &211:CMP #ruler DIV
256:BEQ skip:STA &231
```

And to shorten the program to 255 bytes change line 510 to:

```
510 JSR colour:JSR &FFF4 :TXA
```

— **Chris Nixon.**

Programming roms

£10 Prize letter

WHEN I had my BBC Micro with sideways ram I was used to writing directly to ram to program in my own roms.

But now I have found that the Master 128 doesn't seem to allow this, so I have written the following short program which will achieve this.

The program also takes care of the fact that you need more memory for the source code than the computer has. It works by loading in the source files as overlays and compiling them one by one, without affecting things like forward jumps.

The reason behind using options 0 and 6 is that option 6 will produce code that runs at P% but places it at O% so a copy of the code can be SRWRITEn into the sideways ram socket specified by rom$ in line 50.

To use the following program the overlays must comply with certain rules: All overlays must end with]:ENDPROC; the filenames must have a root name – in this case UTIL – plus a number.

Each overlay must not be longer than 12k, must not produce more than 4k of machine code and all the programs combined must not produce more than 12k of variables.

– **Bruce Adam, Barnhill, Dundee.**

```
   10 MODE 135:HIMEM=&6000
   20 LOMEM=&4000:numfil=1
   30 n$="UTIL":top%=TOP-2
   40 FOR ion=0 TO 6 STEP6
   50 rom$=STR$~6:P%=&8000
   60 FOR F%=1 TO numfil
   70 OSCLI"L."+n$+STR$F%+
" "+STR$~top%)
   80 PRINT"Assembling: "n
$+STR$F%
   90 PROCass:IF ion PROCu
p
  100 NEXT:NEXT:END
  110 DEF PROCup
  120 OSCLI"SRWR."+STR$~HI
MEM+" "+STR$~O%+" "+STR$~P
%+" "+rom$
  130 ENDPROC
  140 DEF PROCass:O%=HIMEM
  150 [OPT ion
```

One-sided assignments

I HAVE typed in Maltese Cross from the November 1986 issue of The Micro User *and it seems faulty in some circumstances.*

I am not technically advanced but I find it diffult to follow the syntax in statements such as line 530 where there are assignments with no left hand side. Is this correct?

Have other bugs been reported in this program since I have also had trouble in positioning dominoes, particularly to the right of the cross? – **R.A. Charlton, Mayfield, East Sussex.**

● We test all programs thoroughly before publication and listings are taken from the working program. There are no errors in Maltese Cross.

The syntax that you mention is not an error. BBC Basic possesses multi-line functions – which are similar to procedures except that they give back a value.

The equals sign tells the interpreter to return to the place the function was called from and give back the value of the expression or variable following the equals sign.

Menu selections

Can you tell me how to automatically catalogue a disc and chain a program from the list? Also can you tell me how to make a powerful shift-down routine? – **A.W.A. Olding, Newbury, Berks.**

● Various menu programs have been written to run the program of your choice after Shift+Break. You'll find one for Basic programs on page 109 of the March 1984 issue of *The Micro User.*

This also has a shift-down routine included. Does any

Turn to Page 156 ▶

LETTERS

◀ *From Page 155*

reader have a full-facility menu program for all programs?

Interword into Basic

I AM interested in a program which will convert Basic programs into Interword files and vice versa.

Can you or your readers help me with this? – **Mrs L.J.Hartles, Harborne, Birmingham.**

● Getting from Basic to Interword is easy, just type *SPOOL (filename), LIST, *SPOOL, which creates an Ascii version of the Basic program, then *IW. (filename) to load the Ascii file into Interword.

To go the other way you must ensure that the Interword line length is beyond the maximum length of the Basic line – so there is no word wrap – and use the SPOOL option from the Interword main menu.

This creates a new Ascii file which you can then *EXEC into Basic.

Modifying the menu

I HAVE just typed in your ADFS disc menu program from the January 1987 issue of The Micro User *and it is very good. I have a model B and second processor.*

I have made some small changes to improve an already useful program:

```
  740 IF C%VDU26,12,20:*DI
R $
  741 IF C%CHAIN(":"+STR$F
%+"."+FNget-path(path$,dir
$)+"."+$name%)
```

With the VDU26 statement I find that adding the ,20 is preferable to the blue screen obtained by the CLG statement.

*The *DIR and line 741 puts the ADFS in the root directory, which enables me to reboot the disc which is not possible with the existing method as the !boot file is in the root directory and the selected program is not.*

The problem I have is how do I make this program run on the second processor? – **G. Coventry, Chippenham, Wilts.**

● The ADFS Menu will not work on the second processor (or Turbo) because it directly peeks the ADFS workspace.

But by copying the relevant information into the second processor the program can be made to work. Just type in the following modifications:

```
   95 DIM base% 1024:F%=0
  100 IF FNos<3 source%=&
1205ELSE source%=&C405
  435 PROCccat(source%,ba
se%)
 1900 DEF PROCccat(S%,D%)
 1910 LOCALA%,L%,X%,Y%:X%
=&50
 1920 A%=5:FOR L%=0 TO 10
23
 1930 !X%=S%+L%:CALL &FFF1
 1940 D%?L%=X%?4:NEXT:END
PROC
```

Confessions of a faint-hearted Micro User

Dynamite from Dottybase

Dear Trev,

It's all your fault. You were my best man. Couldn't you have lost the ring or shot me or something? Or did you feel I deserved Andrea?

I thought that when you muttered "There but for the grace of God..." you were requesting a hymn. Do you know any good Divorce packages for the Beeb? I might need them as Andrea's getting unbearable. And it's all Clive's fault.

It was him who gave me a copy of Maxi Warehouse IV from Dottybase complete with "Added Artificial Intelligence".

"Is it genuine or a rip off?", I asked, fingering the still-hot disc gingerly.

"Listen, that stuff is so new that no genuine copies exist. In fact it hasn't even been nominated for an award yet."

Impressed, I took the disc home and started to read the manual – always a mistake. I don't know about you but I prefer the old kind of software manual, the kind you have to solve.

It may be incomprehensible (look it up if you don't understand it) but at least when you can't get the package working you have a scapegoat. As it is the manual's stunningly clear and full of good advice. I have no one to blame but myself.

Why I couldn't keep it to myself I don't know, but there I was blurting it out: "Andrea, Clive's given me something". After wiping off the Dettol and explaining exactly what I meant, Andrea still wasn't too impressed.

"It's got five programs."

"Why that many? Don't some of them work?"

"Of course they do, but these all do different things."

"Jack of all trades, master of none", Andrea pontificated.

At times I suspect she has a degree in proverbs with added distinctions in cliché and obtuseness. Rather than cast any further pearls before that particular swine I took myself off to Doreen's to try it out.

Have I told you about Doreen's house? Think of Psycho and you're not far wrong. The same applies to her kids, Robert and Marie.

As I might have mentioned, Doreen's is a one-parent family and looking at those two you can imagine what happened to the other parent.

It's the only house I know with a "Dogs Beware" sign. Apparently she keeps discipline in her class by inviting troublemakers to come and play with her kids.

"Come on upstairs", Doreen cried, putting the padlock on the living room door. "They'll be no trouble, they've just been fed."

Happily she'd brought a beeb back from school so I could use Maxi Warehouse straight away. I wish I hadn't. Not that I can really criticise the word processor, it was as good as my old SagePhrase.

The problem was that it had a mind of its own. I didn't object to it correcting my spellings but did it have to criticise my English?

"Boring", came up on the screen as the quick brown fox did whatever it is that quick brown foxes do, and "It's not Shakespeare, is it?" The most cutting remark was "Is this an experiment to see if you eventually type the Bible?"

In desperation I turned to the graphics package. I needn't have bothered. The bar chart option informed me that the Ram and Buffer had the best beer for miles while the pie chart consisted of columns of pies. The histogram worked well though the boobagram option was a surprise.

The whole package was like that. I'll swear the spreadsheet (introduced with music from the Archers) kept swapping rows and columns. And I didn't like the prompt that said "Your move" whenever I delayed a bit.

As for the database, whenever I tried to get a bit of information it would come back with "What's it got to do with you?" or even worse "You've just typed that in, you twit".

And the communications software worked well enough, but every now and then would announce "I'm bored with this bulletin".

Finally, in desperation, I selected Exit. "No, please, don't!" came up on the screen followed by a scream.

"You brute", cried Doreen, "it was only playing."

We then proceeded to "have words". The rest I shall not tell of. After all, would you really want to know how I evaded the kids and got home?

Or just exactly what I did with Clive, the disc and a handy packet of dry-roasted nuts? Yours,

Bob

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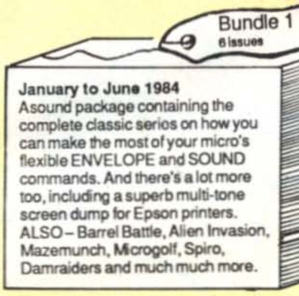

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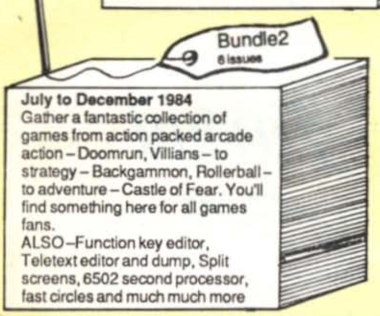

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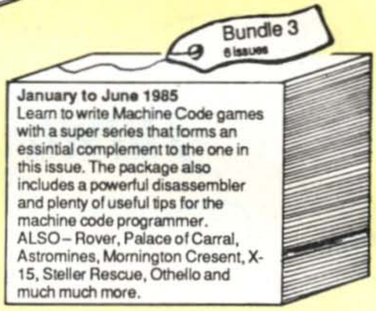

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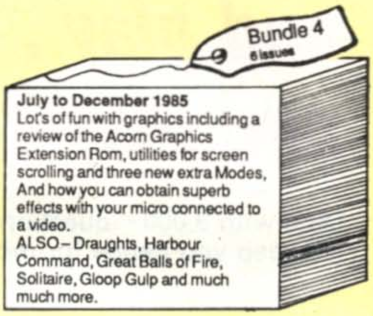

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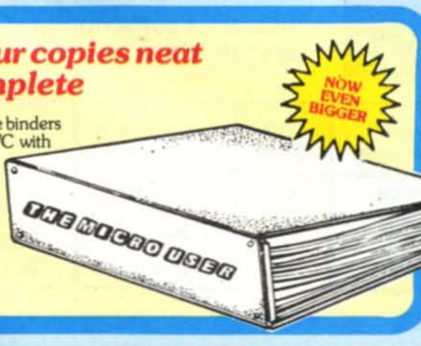

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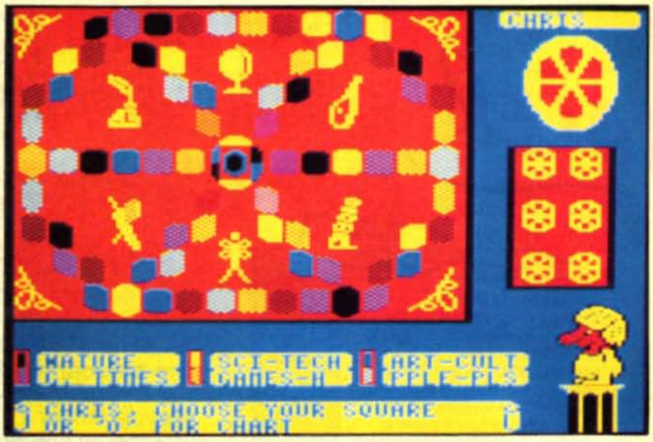

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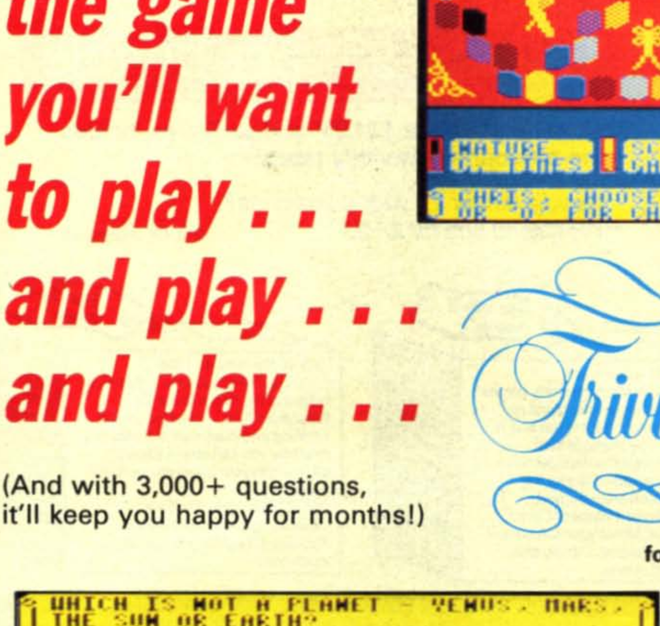

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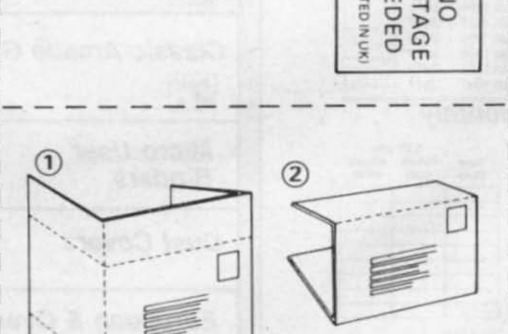

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Advertisers' Index

4mation Educational Resources .. 74
21st Software 66
Advanced Technology Products ... 64
Amig Systems 140
B&S Computing 92
Beebug 16,17,18
C&F Associates 152
Centec 134
Chalice Software 70
CJE Micros 10
Clares Micro Supplies 12
CMS Soft 152
Computer Concepts 22,23
Computer Express 149
Contex Computing 118
C P Microsystems 116
Database Exhibitions 19
Database Publications ... 43,55,106
Database Software ... 46,47,69,110
Data Store 152
Design Dynamics 118
Design People Software 62
Direct Disk Supplies 148
Disking International 14,15
Doctor Soft 131
Flora Electronics 162
G.L.J. Electronics 161
G.P.D. Systems 58
HSV Computer Services 127
IDS Computer Supplies 131
Keyzone 161
Kosmos 149
Leigh Computer Systems 131
Linear Graphics 60
Mancomp 127
Microboss 162
Microdis 70
Microman Computers 89
Micro Media 13
Micronet 800 39
Mighty Micro 162
Mikes Computer Store 58
Minic Business Services 149
Miracle Technology 8
Moordene Associates 161
Morley Electronics 40
Opus Supplies 75,113
Oriole 161
Paul Fray 162
P&H Electronics 50
Pineapple Software 88
Qual-Soft 52
R&D Speech Technology 25
S.A. Software House 161
Saturn Computers 140
School Software 161
Selec Software 132
Silicon City 116
Silicon Vision 134
Softlife 152
Solidisk Technology 26,27,28,29
S.P.Electronics 162
Superior Software 2,163,164
System Software 138
Taxan 6
Teca 161
Technomatic 76-85
Twillstar Computers 144,145
Tynesoft Computer Software 3
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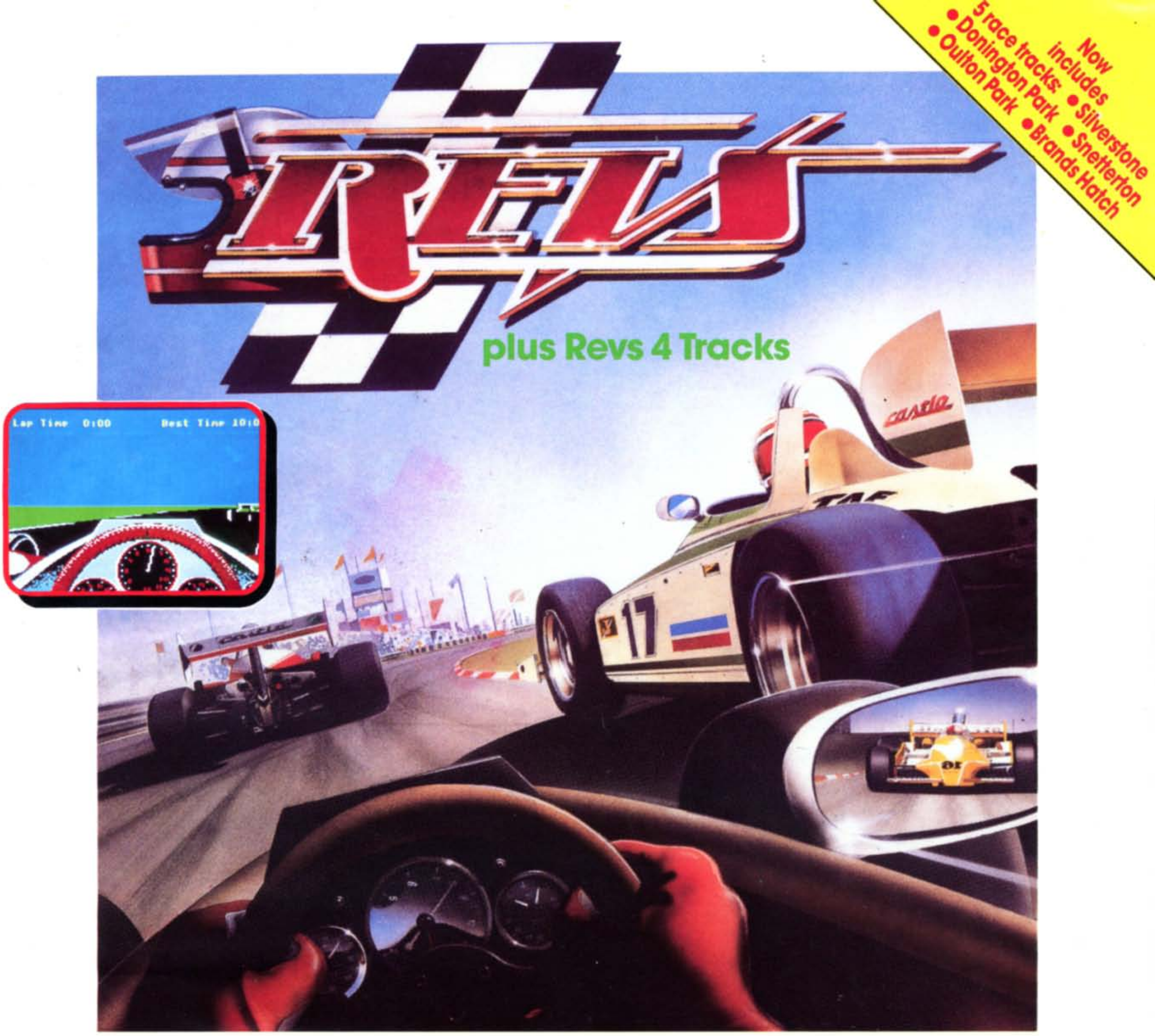
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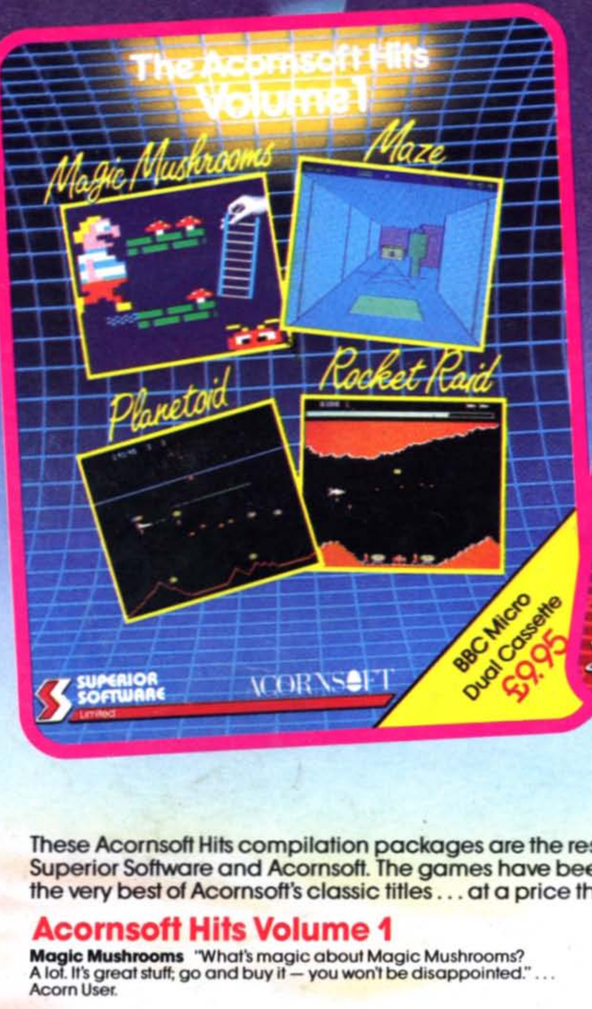

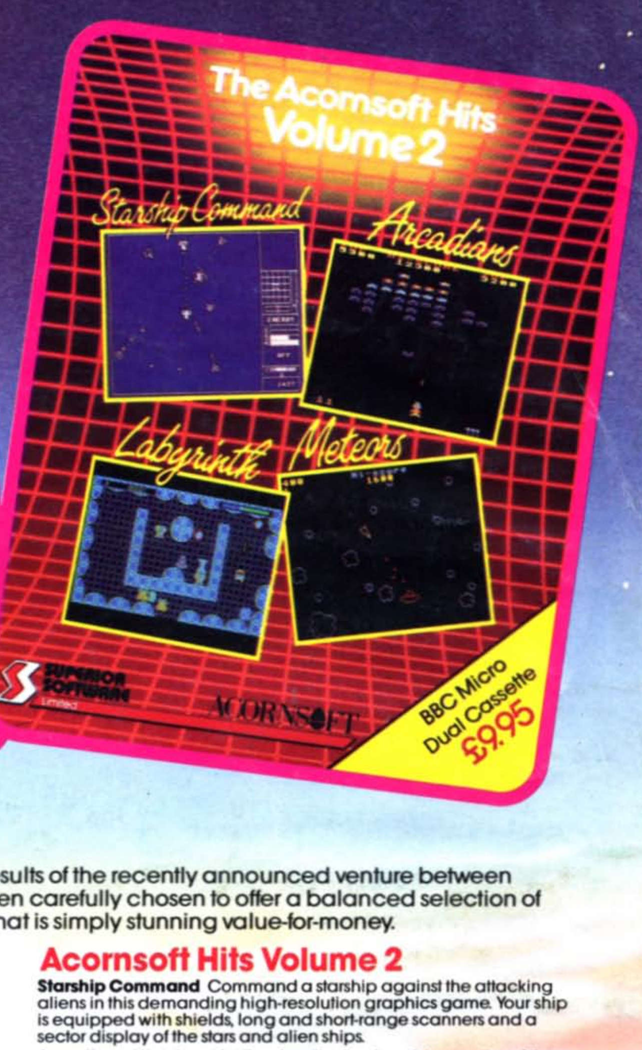

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